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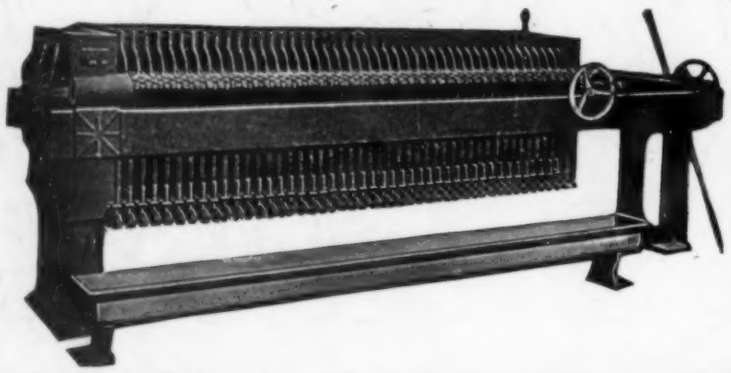

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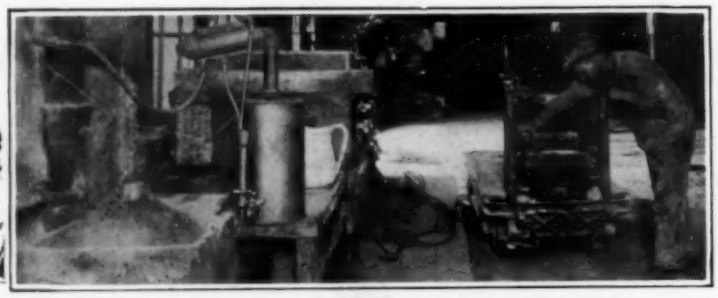

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Editor

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Nineteen Twenty-five

A NEW YEAR! Another mile post from which to review the progress of life's race. For you as an executive, as an engineer, as an operating man or whatever your function may be, has the year been a successful one and does the prospect of 1925 appear rosy? At the end of this new year, is it to be the same old plant, the same old job, the same old technical methods? The instinctive answer is "no," for every engineer realizes that to stand still is to stagnate. But with even a keen desire there are many obstacles in the way. Perhaps there is a superior officer or a board of directors that is conservative and lacking in initiative. Perhaps a rut has grown so insidiously that we do not realize it is there. Perhaps there is a lack of contact with modern technical advance that has left us trailing far behind the leaders.

It may not be inappropriate for each to ask, "What is wrong with this 1924 picture of my work?" For the first step in the direction of improvement is a knowledge of the weakness. Then and only then can a progressive plan be evolved. On the other hand, there is a general formula that may be applied regardless of the personal equation and of the condition in the plant itself. It is an elementary formula, because it is fundamental. And it is simple both of application and of interpretation.

Ask this question, "What am I trying to do?" Let us apply it, for example, to the executive, the engineer and the research man in a company that manufactures green shoe polish. The sales have been low during the past year, but the executive, though worried, is still pleased with the factory, with the personnel and with himself. The engineer is delighted with his production cost figures that show a substantial saving over last year, and the research man is enthusiastic about a new green dye that will make the polish waterproof. An absurd case? Perhaps it is, but are you sure *you* are not manufacturing green shoe polish? Is your research work keeping pace with the latest advances in science? Are you making use of the most modern equipment? Is your personnel enthusiastic and up on its toes? Is your product selling well or badly, and if badly, what is the cause? Is it becoming a green shoe polish? Elementary, but by that same token a safe guide and the only safe one! Let the new year mark a clearing out of underbrush and an elimination of worn-out formulas and shibboleths that have hindered in the past.

For *Chem. & Met.* the new year will be marked by that spirit. The job of the editor is not a job of scissors and paste pot. If it were only that, it would have no constructive place in modern industry. The editor of today must focus and interpret. Out of the mass of material that comes to his attention he must select that which is useful and present it in such a way that it will attract the attention of the reader and interest him. That, too, is elementary, and yet it is the touchstone of success for an industrial paper. It is the ultimate test of service for which every editor worthy of the name strives and which no amount of protesting and lip service will create. *Chem. & Met.* pledges its efforts for your service in 1925. May the new year be prosperous and happy!

Conservation, the Oil Industry's Problem

PRESIDENT COOLIDGE'S appointment of an oil conservation board and his recent remarks on present conditions in the petroleum industry strike a responsive chord among those who have been giving thought to the future of this country's fuel supply. A few in the industry appear to be skeptical of the government's motives and hold that any attempt to restrict the existing scheme of oil production will violate Constitutional rights of property, but fortunately these objectors are in the minority. The greater number concur in the views recently expressed by such leaders as Doherty, Bedford and Teagle emphasizing the real necessity for correcting the basic conditions responsible for the present overproduction, demoralized markets and the industry's uncertain future.

The President recognizes and aptly stresses the peculiar responsibility of the government in helping to untangle the knotty problems that lie immediately ahead of this industry. "The future," he said, "might well be left to the simple law of supply and demand but for the patent fact that the oil industry's welfare is so intimately linked with the industrial prosperity and safety of the whole people that government and business can well join forces to work out this problem of practical conservation." In a nutshell that problem is, first, to put a stop to drilling wells before there is any real need for them, and second, to make certain that oil once produced is conserved through more efficient utilization. No exception is likely to be taken to the President's conclusion that "overproduction in itself encourages cheapness, which in turn leads to wastefulness and disregard of essential values."

To find an effective means of keeping the oil in the ground—that is, to restrict its production in the oil fields—is a problem that has already had the attention of the industry. Several apparently practical schemes

have been proposed, such, for example, as that of H. L. Doherty, who would regulate production by state legislation. Many of these, however, overstep or at least tread dangerously near the legal boundaries set up by the Sherman law and for that reason industry in general will be interested in seeing what attitude a government board will take toward the possibility of amending certain restrictive features of that legislation.

The President appreciated the necessity and specifically provided means for the fullest co-operation between the board and the oil industry. It is recognized at the outset that a conservation board would be powerless to exercise authority over all of the producers of petroleum. To be sure, it might draft a law that would control operations on the public domain, but this would not reach the greater reserves under private ownership nor would it stop the individual whose drilling on a small holding forces his neighbors either to follow his example or to sit idly by and see their oil drained off.

What is needed is first an agreement in the oil industry that, for its own good, its productive machinery will be reorganized on the more logical basis of market demand and economic conditions. Then, with the full co-operation of the industry itself, a workable scheme must be devised that will provide for practical conservation all along the line—in production, transportation, refining and distribution. This is a large task, to be sure, but one that from the viewpoints of both industry and defense warrants the thoughtful attention of the best minds in government and private enterprise.

The Attorney-General And Trade Associations

WHILE no new light has been shed on the lawful activities of trade associations since Mr. Hoover tried in vain to elicit some constructive thought from Mr. Daugherty, there is encouragement for the future of these organizations in the expressed attitude of the Department of Justice under Attorney-General Stone. Almost lost in the voluminous report of the Attorney-General for 1924 is a paragraph relating to the work of the anti-trust division, which is concerned with the enforcement of the anti-trust law. Speaking of trade associations, the report says, "Many of these are operating along lines which are entirely lawful and of considerable benefit to the members and to the public; some are groping in the twilight zone of illegality; a few are wholly illegal." Thus there is not only no hostility to trade associations in the office of the Attorney-General but a friendly recognition of the practical advantages and benefits of these organizations to the members and to the public. Further than this, the main purpose of the anti-trust division is declared to be the prosecution of well-chosen cases which, when settled, will not only define the activities of trade associations in a negative manner but will, on the other hand, "aid honest business men to determine what measure of co-operation they may lawfully adopt."

In all probability industry cannot expect more than this from the Attorney-General's office. But the two quoted extracts are in themselves sufficient encouragement for the organization and conduct of trade associations that have no unlawful intent. Price fixing is under the ban, as is also the exchange among competitors of information that will enable them to combine successfully against consumers. Anyone who undertakes such activities is courting trouble through the "conscious illegality" of his acts. On the other hand, there are literally dozens of legitimate activities in which trade associations can engage without interference by the Department of Justice. The situation would seem to be sufficiently clear so that one who is right-minded need not go far astray.

Oxalic Acid Continues In the Tariff Limelight

FEW commodities—perhaps no other single chemical—have figured in tariff discussions as prominently and as persistently as oxalic acid. The executive order that last week increased by 50 per cent the duty on this article calls to mind other high-spots in the tariff history of oxalic acid that have had technologic as well as economic bearing on this branch of chemical industry.

At the time the tariff act of 1909 was being framed, the late Colonel Lewis Emery, of Bradford, Pa., submitted a stirring appeal to Congress for protection against a German competitor who was reputed to have tried various and nefarious schemes for destroying the young American industry. The Bradford plant made its acid by the then standard method of fusing sawdust with a mixture of alkalis, but from the American viewpoint the process had the one disadvantage of requiring German-controlled caustic potash as one of its essential raw materials. Colonel Emery succeeded, however, in persuading Congress to place a duty of 2 cents on oxalic acid at a time when it was selling for around 7 cents per pound.

But in the meantime the Germans were also busy, perfecting the Goldschmidt or formate process in which carbon monoxide is combined with caustic soda under a pressure of about 10 atmospheres to form sodium formate, which on further heating is changed into the oxalate. The new process proved so much more efficient than existing methods that the Germans were soon able to regain control of the domestic market and by 1913 imports had mounted to 8,000,000 pounds. So Colonel Emery again took his brief to Congress, but this time the low-tariff advocates were in the saddle and instead of increased protection the duty was actually lowered to 1½ cents per pound. Doubtless this would have sounded the death knell of the domestic industry with its obsolete production method had not the outbreak of the war cut off the imports from Germany. Prices trebled within a few days in 1914 and by the middle of 1916 had reached 75 cents per pound. These would have indeed been rosy days for the plant at Bradford had it not experienced such great difficulty in using the crude domestic potash obtained from wood ashes. Also the high prices encouraged the study in this country of several other processes of manufacture, but only one plant, which used a modification of the German formate method, had reached large-scale commercial production by 1917. Then set in a period of real competition between the two domestic firms in which the newer and more efficient process gradually got the upper hand. With the return of the foreign product in the American market in 1919, prices began to decline and again the domestic producers asked for tariff aid. This time an

obliging Congress provided a duty of 4 cents per pound, but even this proved insufficient to save the older producer, who was at last forced to bow to the combination of the better technology of his domestic rival and the lower production costs of his German and Dutch competitors. Prior to this, however, a new American producer had entered the field also to use the formate method but with a very considerable advantage in the fact that at his plant large quantities of carbon monoxide were available as a byproduct of other operations.

When the so-called flexible tariff provisions of the act of 1922 became effective, one of the domestic producers petitioned for an increase in duty and he was immediately countered by the importer of the Dutch product, who applied for a decrease. Costs of production at home and abroad were obtained by the government and for more than a year the Tariff Commission pondered over the question before finally sending its unanimous recommendation to the President. Then came the proclamation, issued Dec. 29, increasing the duty from 4 to 6 cents per pound—the full 50 per cent permitted by the tariff act.

Thus was written another chapter in the tariff history of oxalic acid. Just how great an influence the new duty will have on the market price for this commodity or on the competitive situation as far as the foreign product is concerned remains to be seen. But judging from experience, it is a move that promises interesting economic developments and, perhaps, further technical advances.

Education by Disaster in Dust Explosion Prevention

SPEAKING at a conference of safety engineers at San Francisco some time ago, D. J. Price, of the U. S. Department of Agriculture, emphasized the fact that those in control of industries in which a flammable material is the basis of a dust formed at some stage of the process of manufacture almost invariably wait until an explosion occurs before they awake to the hazard that exists. Experience is a costly teacher, but recent researches and happenings indicate that there is wisdom in accepting the conclusion that if a material is flammable, its dust is explosive; and foresight is needed to provide against the disaster that may ultimately happen in consequence of lack of caution and an ignorance of the danger on the part of employees.

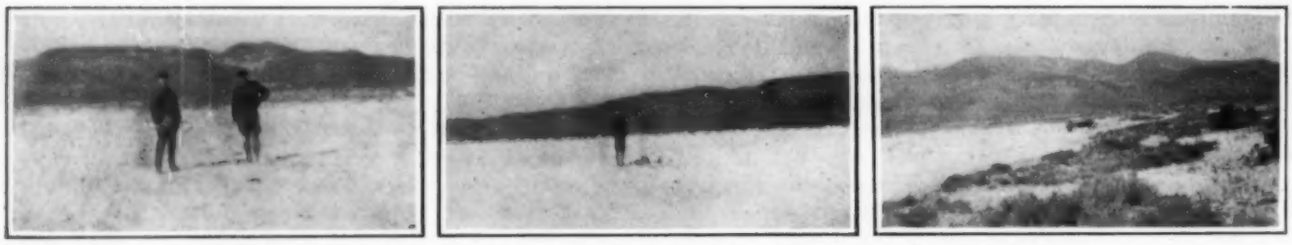
The explosibility of flour was brought home in a tragic manner early in 1878, when the wrecking of a Washburn-Crosby mill resulted in the loss of eighteen lives. Since then the tendency has been toward the design of concrete structures, which, however, are far from proof against collapse or wreckage if an explosion occurs. The so-called daylight-construction factories appear to withstand the effect of dust explosions better than any other type.

Precautionary measures would seem to center around extreme caution in the protection of electric light bulbs and the avoidance of a naked flame in the vicinity of elevators, bins and other equipment provided for the conveyance or storage of the dust. Fire in some form or other is the cause of such explosions, which arise from conditions that demand unceasing vigilance. The disastrous explosion at a starch factory a year ago seems to have been caused by a small fire, the result of an overheated bearing. In the wheat fields, the ever-recurring smut-dust explosion disasters in threshing machines are due to static electricity that may reach a pressure of several thousand volts, caused by internal friction. The efficient grounding of the apparatus is an effective protective measure. The explosive nature of coal, coke and charcoal, when pulverized, is well known; but the majority of other flammable dusts are more dangerous than either. Other industrial products the handling or manufacture of which involves dust-explosion hazard include rice, sulphur, cocoa, sugar and the more easily oxidizable metals, such as magnesium and aluminum. The danger hovers over some of the most important world industries, in which operations are carried on in immense units. The possibility of loss of human life should act as an incentive to a demand for extreme caution; and the liberal education of employees, in an effort to familiarize them with the effect of carelessness, is imperative. The tendency of the times in technical progress is to benefit by the mechanical improvements in grinding and separating equipment that have become available in recent years, and used for the manufacture of a product in an extremely finely divided state. Provision for air separation or screen classification, and the collection and storage of the dust, usually involve an ample supply of air, without which the explosion cannot occur.

Too much emphasis cannot be laid on the need for general education among workers on the principles of combustion and a recognition of the widespread nature of the hazard. When a cinnamon-grinding plant blows up, one is inclined to be mildly surprised; but a hundred and one other flammable products are likely to act in a similar manner under the same conditions. Instances are on record which indicate that an explosion may not occur until after the plant has been in operation for a quarter of a century or more. Immunity throughout a period such as this indicates the comparative insignificance of risk. But accident is preventable; and, unless precautionary measures are taken, there is no saying when a second disaster may occur.

Novel Recognition of Pasteur by France

MAIL arriving from France bears a new series of postage stamps portraying the bust of Pasteur. As far as we are aware this is the first time that a scientist has been thus nationally honored. It has been customary for the nations to commemorate in this manner the services of great statesmen and warriors; but at a time when France might have been justified in selecting a great military leader she chose one of her most eminent scientists for this conspicuous honor. The incident suggests the educational value of similar action in the United States. Not only would our people thus become familiar with names and faces now known to only a few, but the world at large wherever our mail might go would learn to know and recognize the great contributors to scientific progress in the United States. If the National Academy of Sciences should see fit to sponsor a movement in this direction, it is more than likely the government would be inclined to consider it favorably.



Some Physical Characteristics of the Huge Saline Deposit as Shown by the Camera

High-Grade Sodium Sulphate by Solar Evaporation

A GOVERNMENT lease for 20 years, with the consideration that one-eighth of the receipts be returned to the Treasury, has been granted to G. W. Elder and associates, incorporated as the California-Nevada Sodium Sulphate Co., on 1,440 acres of saline deposit near Wabuska, Nev., one mile from the Southern Pacific lines.

At present the crust of the deposit is being removed, dried and broken, for shipment in bulk at the rate of about two cars per week, to Louisiana, Wisconsin, Minnesota and Canada. A typical analysis of this material is as follows: Na_2SO_4, 98.19 per cent; Na_2CO_3, 0.13 per cent; NaCl, 0.23 per cent; insoluble and dirt, 0.52 per cent; moisture, 0.23 per cent; undetermined, 0.7 per cent; loss at 110 deg. C., 16 per cent.

The method proposed for the production of high-grade crystals, to be put into operation as soon as water is available from nearby wells, is simple and ingenious. Small-scale production has demonstrated the practicability of the plan: The surface of the dry lake is first flooded with water, dissolving the salts, which recrystallize. This phase of the operation results in the formation of from 2 to 3 ft. of crude sulphate. The deposit is then re-flooded with water to a depth of about 3 in. In about 15 days the water has been evaporated and a crop of high-grade crystals of sulphate is formed. These are removed and the recrystallization process is repeated. Water is obtained at a depth of from 60 to 80 ft.

The harvested crystals, which contain no magnesium, are dried in the sun for about 15 days, then crushed by passage through rolls. A typical analysis of the recrystallized product is as follows: Na_2SO_4, 99.59 per cent; moisture at 110 deg. C., 0.09 per cent; impurities, 0.32 per cent. The depth of crude crystalline material below the top crust is estimated to average about 8 ft.

Working the Deposit

At right, large pieces of crystallized salt broken out of the mass with bars and piled up to dry.

At the bottom, two views of the stacks of salt drying and ready for shipment by truck to the railroad.

Electric Power as a Byproduct of Process Steam Generation

A Discussion of the Different Methods That May Be Used to Accomplish This — The Apparatus Required and the Relative Costs

By Theodore Maynz
Consulting Engineer, Cleveland, Ohio

IT IS only in certain cases that the primary manufacture of electric power by industrial concerns is profitable. Usually it is more advisable to purchase the power from a central station, even though the cost may be a little in excess of the theoretical cost of making power.

The manufacture of electric power as a byproduct of process steam, however, is, in nearly every case, extremely profitable and advantageous. It is the purpose of this article to show the different methods of procedure, the apparatus required, and, by a few examples, the relative cost. The first factor to consider is the relative values and characteristics of steam at various pressures and temperatures. Fig. 1 shows pressure-temperature curves of saturated steam (from Marks & Davis tables). Fig. 2 shows the total and latent heat of saturated steam with varying pressures.

Since the volume of steam decreases with the pressure and since the distribution of steam requires expensive pipe work, it is advantageous to generate it at as high a pressure as is economically possible. For the same friction pressure drop the same weight of steam can be transmitted through a 3-in. XH pipe at 200 lb. gage as through a 10-in. standard pipe at 1 lb. gage, while the pressure loss at 200 lb. is relatively unimportant and at 1 lb. gage it is of extreme importance. The relative weight of 10-in. standard pipe is three and one-half times that of 3-in. XH, while the cost of labor and fittings is even greater than the cost of pipe.

The cost of boilers, etc., is of course much greater for the high-pressure than the low-pressure installation, but the difference is not so great as one might expect, when the total cost, including brickwork, grates or stokers, stacks, breechings, building, etc., is considered. The boilers themselves will make up only about one-third of the total boiler plant cost, so that a 33⅓ per cent increased cost in this item will mean only about 10 per cent increased plant cost.

It is seen therefore that where there is a large distribution of steam, with relatively long transmission distances, such as are caused by a separate boiler house, it might be cheaper to build a high-pressure steam plant with high-pressure distributing mains rather than a low-pressure plant, even though the steam requirements are quite low in pressure.

The operation of the high-pressure plant should not be any costlier than the low-pressure plant, as the pressure drop through reducing valves, etc., is recovered in the steam, and the slightly greater loss due to radiation from the boilers can be easily compensated for by slightly thicker pipe covering.

A comparison of pipe radiation loss would be interesting. Assuming a room temperature of 70 deg. F. and a heat loss of 2 B.t.u. per square foot per hour per degree mean temperature difference, the heat loss for the 1 lb. steam in a 10-in. pipe would be 815 B.t.u. per hour per foot of pipe, while with the 3-in. pipe and 200 lb. steam, the loss would be 292 B.t.u. per hour per foot of pipe length. This is, of course, due to the larger surface of the 10-in. pipe carrying the low-pressure steam.

However, if we generate steam at high pressure and require only low pressure and temperature, we can substitute either engines or turbines instead of reducing valves, and extract the work from the steam to generate power or electrical energy and use the low-pressure exhaust steam for the heating or process.

Let us see the relative efficiency of the various methods of manufacturing electrical power. Assume

Here are the general conditions governing the types of apparatus used for generating power. This is by no means a formula, but a guide for a preliminary choice:

1. Non-condensing engine. Atmospheric steam for heating or process, with a balance between the power and steam demand, or for a certain portion of the time wasting exhaust steam. No condensing water.
2. Non-condensing turbine, atmospheric exhaust. Same as above, but no waste of exhaust and all steam utilized fully in process. Lower investment than engine, but higher water rate.
3. Non-condensing turbine, high-pressure exhaust. No condensing water available. All exhaust utilized in process requiring high-pressure steam.
4. Bleeder turbine low- or high-pressure extraction. In place of case 1 or 3, where process steam demand is variable. Extraction automatically supplies steam for process at constant pressure in quantities according to demand. Condensing water necessary. Comparatively high investment.
5. Mixed-pressure turbine. Low-pressure waste exhaust steam available to supply the average load. High-pressure steam to supply fluctuations of load and exhaust supply. Condensing water necessary. High investment both in turbine and piping per kilowatt capacity.

that the boiler room has an evaporation of 8 lb. of steam delivered to the mains per pound of coal fired. We can generate current by a non-condensing engine or turbine. We can use low-pressure (150 lb. gage) saturated steam, we can use high-pressure (200 lb. or over) superheated steam. The size of the units will also affect the economy, while the type will affect the comparative installation cost.

Assuming a typical case of a 150-lb. saturated steam plant operating a high-speed unia-flow engine of about 200 kw. with a water rate of 32 lb. per kw.-hr. and 8 lb. steam per pound of coal, the coal required per kw.-hr. is 4 lb. To this must be added 10 per cent for banking and other losses, giving a plant rate of about 4½ lb. of coal per kw.-hr. With coal at $4 per ton in the bunkers, the fuel cost would be 0.9c. per kw.-hr. If the fuel cost is about 60 per cent of the total cost, we could then generate a kilowatt-hour with this equipment for 1.5c. This does not represent the average results, but only what should be done, as there are comparatively few isolated plants having the equipment and competent personnel to produce a kilowatt-hour, under the above conditions, for as little as this.

Let us assume another case. With a 10,000-kw. condensing turbine unit operating at 200 lb. and 200 deg. superheat against a 29-in. vacuum with a water rate of about 13½ lb. per kw.-hr., we could produce a kilowatt-hour for about 1.9 lb. per kw.-hr., or about 0.4c. for fuel. This would bring the total cost to about 0.65c. per kilowatt, exclusive of investment charges. The cost of a plant such as above would be probably $180 per kw.-hr., including stand-by apparatus, so that if we had a 50 per cent load factor or produced about 4,500,000 kw.-hr. per year, the fixed charges at 16 per cent total would amount to about 0.65c. per kw.-hr., or 1.3c. per kw.-hr. total cost of power.

It can be seen that even with comparatively large units and expensive and economical apparatus, the cost of making power, primarily, is rather high, the investment large, and the results quite often very unsatisfactory.

Making power as a byproduct, however, is an entirely different proposition. The methods used can be divided into three distinct types:

1. High-pressure engines or turbines exhausting into process mains.
2. Bleeder or extraction turbines.
3. Low- or mixed-pressure turbines using process exhaust.

A brief description of each type of machine follows:

1. The high-pressure machine exhausts steam at from about atmospheric pressure up to, in some cases, as high as 100 lb. gage back pressure. A certain amount of heat is extracted from the steam, converted into mechanical or electrical energy, the remainder, passing from the exhaust into the steam mains, being used for heating or process. This method is extremely efficient, as the only energy extracted is that due to the work done plus the radiation, mechanical and electrical losses. Thus a kilowatt of electrical energy can be produced for approximately 4,000 heat units and a thermal efficiency of about 85 per cent. This is extremely high economy compared with even a modern central station operating at about 18,000 B.t.u. per kw.-hr. exclusive of high transmission and conversion losses.

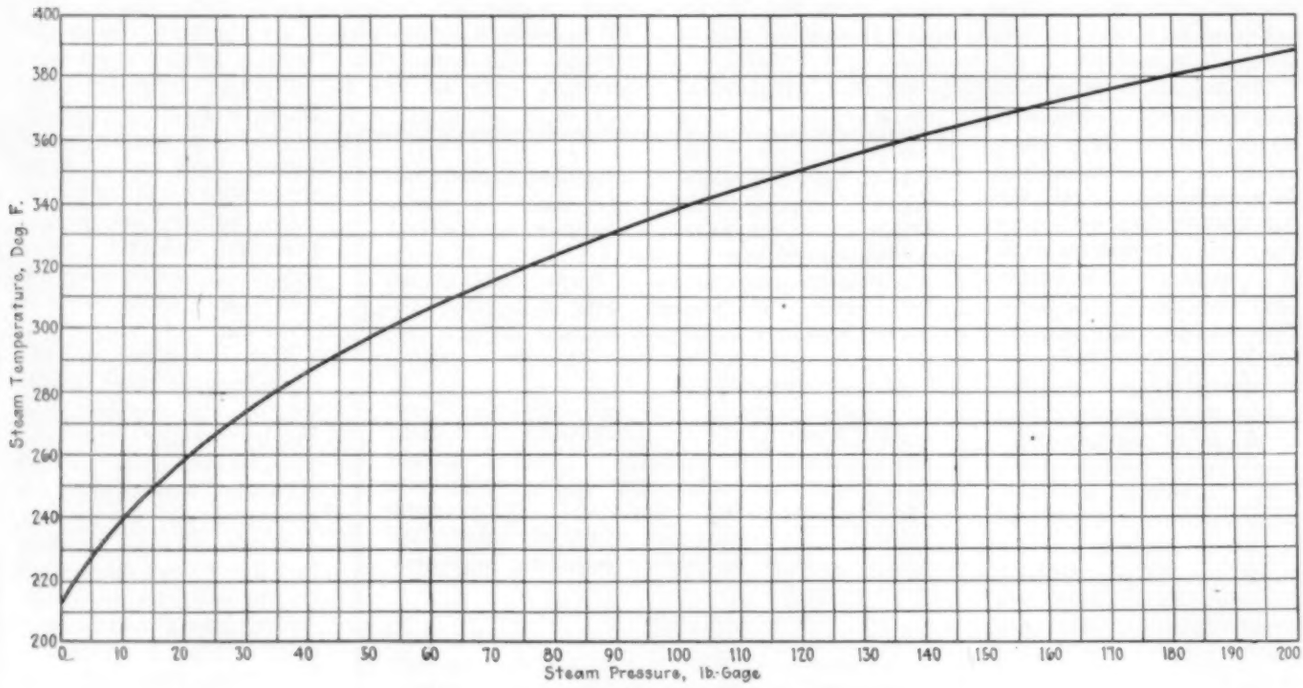


Fig. 1—Relation of Steam Temperature to Pressure

At the start, this curve shows that the temperature of the steam increases rapidly with pressure, but the curve flattens out and the temperature increase falls rapidly.

2. The bleeder or extraction turbine is a condensing turbine from which a portion of the steam is extracted, having done a certain amount of mechanical work in the first few stages. This bled steam is used in process, the remainder going through the low-pressure stages and exhausting into the condenser. The bleeding is entirely automatic, so that a constant pressure is maintained in the bleeder mains, steam extracted as needed, independent of the electrical load on the turbine. If large quantities of hot water are required, the vacuum can be regulated so that the jet condenser discharge

gives the required temperature. These turbines are not so economical as condensing turbines of the same type and size, but when proper allowances are made for bled steam, the entire process efficiency is extremely high.

3. The low-pressure turbine takes the waste exhaust steam, such as from drop forge, steel-rolling mills, etc., and produces electrical energy from steam at about atmospheric pressure expanded to 28 or 29 in. vacuum. Since the supply of low-pressure exhaust is usually very fluctuating, these turbines are usually equipped with one or two high-pressure stages and a governor actuating the steam admission to these stages, so that should the load demand exceed the supply of exhaust steam, the required amount of high-pressure steam is automatically admitted and then reduced or shut off as the load drops or as the exhaust supply again becomes sufficient. Thus electrical or mechanical energy can be produced from a waste product and produced for practically no additional fuel. This type of turbine is called a mixed-pressure turbine, and of course operates condensing. In conjunction we can use an accumulator to store the low-pressure steam and thereby reduce the requirements for high-pressure steam.

An actual example in the use of a non-condensing una-flow engine in an industrial plant is given below:

Working hours, 18 hr. per day.....	5,100 hr. per yr.
Energy requirements, 170 kw. demand	960,000 kw.-hr. energy
Heating requirements (no power)...	26,300,000 lb. steam

Assume a una-flow engine operating at 150 lb. steam and 32 lb. per kw.-hr., exhausting into the heating mains during the winter months and wasting to atmosphere during the summer. To produce the 960,000 kw.-hr. will require 30,700,000 lb. of steam, to which must be added 1,800,000 lb. for operation of pumps and auxiliaries, or a total of 32,500,000 lb. of steam for engine operation. An analysis shows that 11,000,000 lb. additional steam is required for heating the building during the the cold months and at nights. The stand-

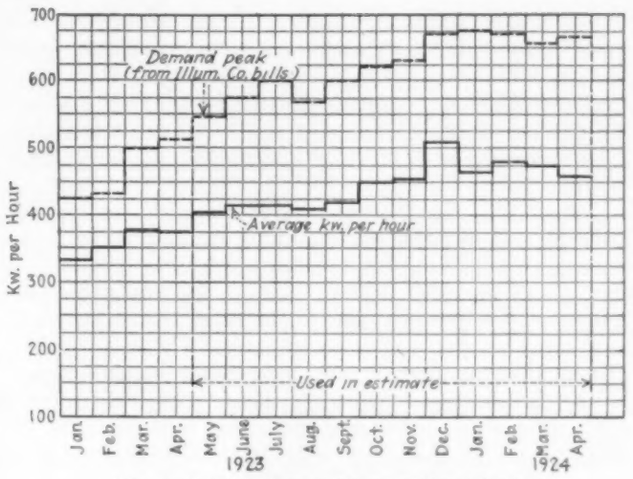


Fig. 3—Electric Power Consumption Chart

This chart shows the load at the factory mentioned in the text, where bleeder turbines now generate power as a byproduct and supply heating and process steam at the required pressure and $28,000 per year is saved as against the cost of supplying the same requirements with central station current.

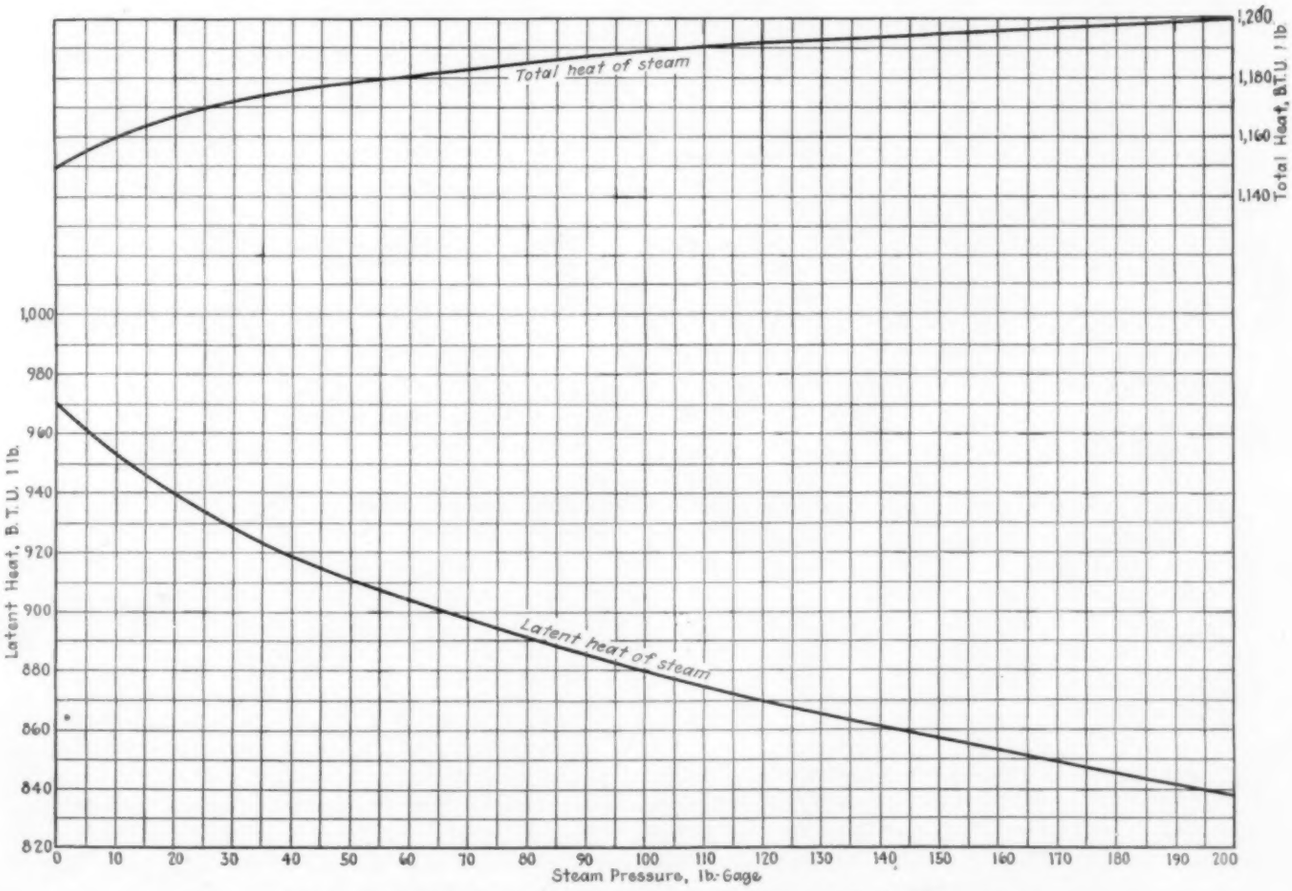


Fig. 2—Total and Latent Heat of Dry Saturated Steam at Various Pressures

From these curves and that in Fig. 1, it can be seen that the heating effect of low-pressure steam is almost as great as that of high-pressure, so that for most process requirements comparatively low-pressure steam will do. It is this characteristic that permits the byproduct manufacture of electric current.

by loss, and banking coal is 100 tons per year. The total coal requirement at 7½ lb. evaporation per lb. of coal is 3,000 tons. The credit for heating to produce the 26,300,000 lb. required when no power is made is 1,750 tons of coal, leaving a net coal consumption of 1,250 tons of coal directly chargeable to power production.

Thus, by using the exhaust for heating, power can be produced for 2.6 lb. coal per kw.-hr., or with $4 ton coal, at a fuel cost of about 0.5c. per kw.-hr. If this problem is analyzed further, we find that the labor cost for five men and engineer is $8,600 per year, additional supplies and maintenance $1,200 per year, and the fixed charges on the additional equipment cost is $3,000 per year. No supplies or fixed charges are assumed for the boiler plant, as this is practically the same in both cases, and only the additional costs of these items have been included.

Heating and Power Costs:		
Fuel	$12,000	
Water	100	
Labor	8,600	
Supplies (for engine & equip.)	1,200	
Fixed charges (for engine & equip.)	3,000	
		$24,900.00
Heating Costs:		
Fuel	$7,000	
Water	25	
Labor	2,200	
Supplies	.....	
Fixed charges	.....	
Total		9,225.00
Additional cost of power		$15,675.00
Cost of power per kw.-hr.		1.63c.

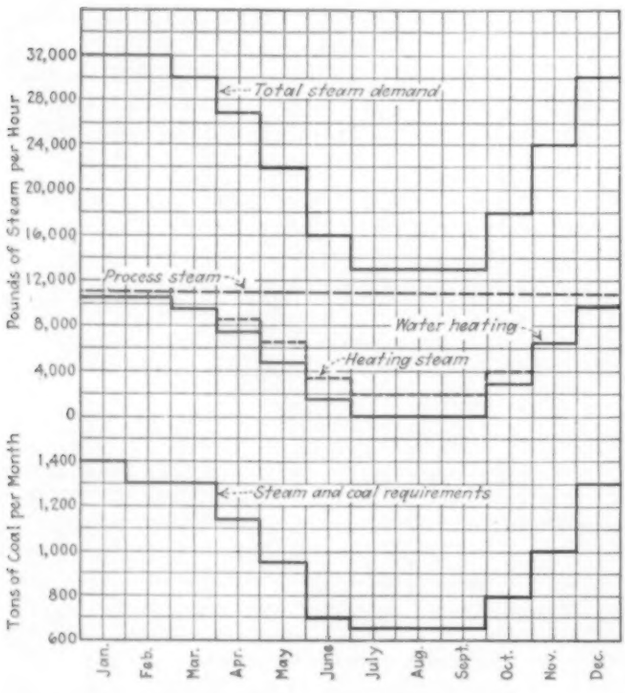


Fig. 4—Heat and Process Steam Load Chart

This chart shows the steam load of the plant used as an example. This load was formerly supplied from low-pressure steam generation, but now the steam is generated at high pressure and gives up its power in a bleeder turbine.

Central station power costs $1.50 per kw.-hr. demand and 1.3c. per kw.-hr. of energy; the total cost of purchased power would be $1,295 per month, or 1.62c. per kw.-hr., so that it would not pay to tie up $25,000 additional capital and take the required trouble, supervision and work to make power.

Should this plant have, in addition to its steam load, a process load of 5,000 lb. of steam per hour at 1 lb. gage throughout the year, then all power produced

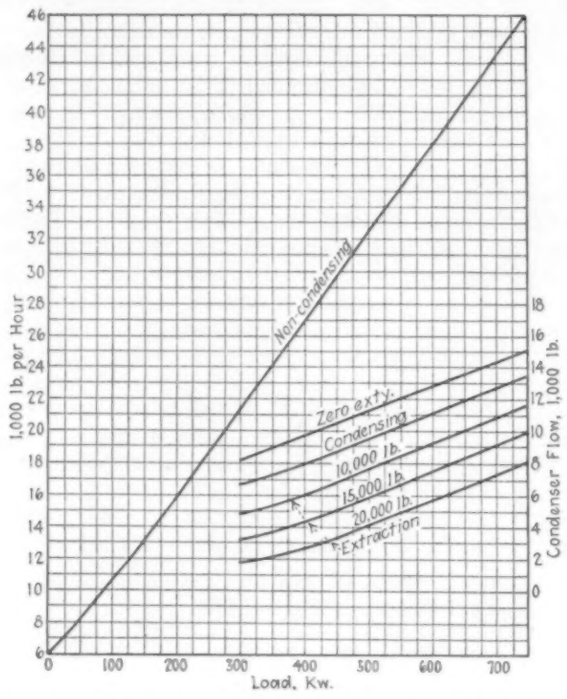


Fig. 5—Steam Flow to Bleeder Turbine Referred To in Figs. 3 and 4

would be byproduct, and the problem would be approximately as follows:

Total steam required	No Engine	With Engine
Heat, lb.	26,300,000	26,300,000
Process, lb.	25,500,000	25,500,000
Used in making electric energy	.....	4,700,000
Total, lb.	51,800,000	56,500,000
Coal at 7½ lb. evporation, tons	3,450	3,760
Stand-by and banking, tons	100	100
	3,550	3,860
Cost at $4 per ton	$14,200	$15,440
Labor cost	5,000	8,600
Miscellaneous supply and repair	.....	800
Fixed charges on engine equipment	.....	3,000
Total cost per year	$19,200	$27,840
Additional cost of power	.....	8,640
Total cost per kw.-hr.	.....	0.9c.

This shows that by the absorption of all the steam from the engine in heat and process and the requirements of firing labor and boilers in operation throughout the year for the process steam, the additional labor for the two engineers and the additional supplies and repairs for the engine have been reduced considerably, and the manufacture of power would show a net saving of about $7,000 per year above the cost of purchased power, or a net return of 28 per cent (after all charges) on the $25,000 additional capital required.

The use of high back pressure turbines for process (such as in rubber plants) to produce a portion of the power is shown by the following example: The process requires a maximum of 70,000 lb. per hour with an average of 40,000 lb. per hour for 24 hours per day for 280 days per year. This steam can be

produced at 100 lb. in boilers and piped direct to the process, or it can be produced at 250 lb. gage, 100 deg. superheat, run through a turbine and exhausted at 100 lb. gage.

Such a turbine would be about 1,000 kw. capacity with a water rate of about 76 lb. per kw.-hr. at full load. The theoretical heat drop available for these conditions would be, at constant entropy, 1,265 — 1,189 = 76 B.t.u. and a theoretical water rate of 45 lb. per kw.-hr. Since the water rate actually is 76 lb., the Rankine efficiency is 45 ÷ 76 = 59.3 per cent, and the total B.t.u. used is 76 × 0.593 = 45. Thus the exhaust has a heat value of 1,265 — 45 = 1,220 B.t.u., and at 100 lb. gage this would mean about 55 deg. superheat, or a temperature of 393 deg. F.

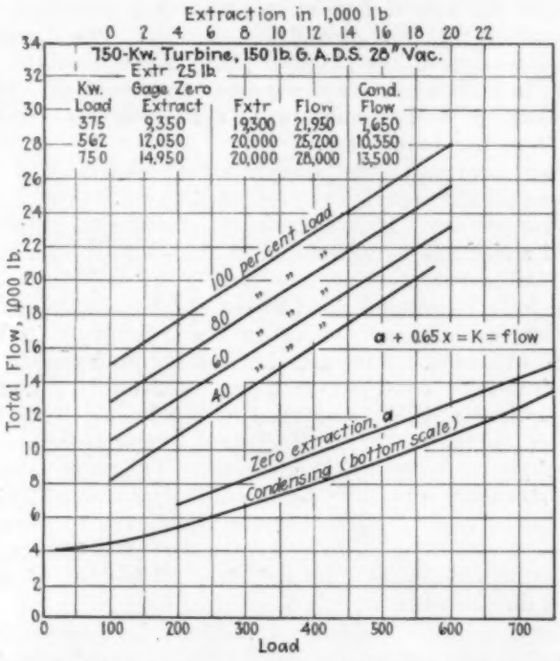


Fig. 6—Steam Extraction From Bleeder Turbine Referred To in Figs. 3 and 4.

If, instead of the bleeder turbine of the example, two condensing turbines had been used for generating the current, without bleeding, the additional steam consumption, labor and maintenance would have cost $17,500 and the investment charges $17,500, or a total of $35,000 per year, for generating current. This would mean a saving of $11,000 per year on an investment of $86,000, or a net return of only 13 per cent. Even this return was greater than can usually be expected, as only $1,500 additional labor was required and all the water for condensing was waste water from process requirements.

The heat input to produce 100 lb. gage dry saturated steam at 70 per cent boiler efficiency is 1,189 ÷ 0.70 = 1,700 B.t.u., and at 250 lb. and 100 deg. superheat is 1,265 ÷ 0.70 = 1,810, or 110 B.t.u. more in the furnace. Therefore, the annual coal required for 40,000 lb. of steam per day for dry saturated steam is:

$$\frac{40{,}000 \times 24 \times 280 \times 1{,}700}{12{,}500 \times 2{,}000} = 19{,}040 \text{ tons}$$

and for 250 lb. superheated is:

$$\frac{40{,}000 \times 24 \times 280 \times 1{,}810}{12{,}500 \times 2{,}000} = 20{,}272 \text{ tons}$$

or 1,232 tons additional to produce about 3,500,000 kw.-hr. With coal at $4 per ton, the total additional cost would be $4,928, or 0.14c. per kw.-hr. with no allowance for the additional heat in the exhaust steam from the turbine.

The cost of such a turbine would be about $40,000, installed with foundations and switchboard, which would mean about $6,500 per year carrying and maintenance charges, or a total cost of about 0.35c. per kw.-hr. for fuel and fixed charges. There would be no additional labor necessary. As against purchased power at 1.62c. per kw.-hr., the total saving would be about $45,500 per year, or more than the required amount to retire the investment.

An example in the use of bleeder turbines is shown by an actual case of a factory having a heating and process load as shown by Fig. 4, and the electrical load as shown by Fig. 3. A 750-kw. bleeder turbine, extracting steam at 25 lb. gage, was chosen. The extraction characteristics are shown by Figs. 5 and 6. A detailed analysis, entirely too lengthy to be shown here, showed that the fuel labor and supplies for generating steam cost about $55,000, with an additional cost of $46,000 for purchased electric current. The additional cost, for generating all the current, of fuel, labor and maintenance, was about $6,500, with fixed charges of $11,500 per year on an investment of $58,000 for one 750-kw. bleeder turbine and one 500-kw. non-condensing turbine (for stand-by) complete with condenser, foundations, switchboard, piping, etc. This shows a net saving of $28,000 per year over purchased power, retiring the investment in 2 years.

The use of low- or mixed-pressure turbines shows a very attractive proposition, where they can be used. The requirements are a supply of exhaust steam and a plentiful supply of cold condensing water. These turbines are, of course, very sensitive to vacuum conditions, since their entire working pressure range is about 15 lb. when operating low-pressure. Therefore a 29-in. vacuum in winter and not less than 27½-in. in summer is essential. While operating low-pressure the only additional fuel requirement is that necessary for operating the condenser pumps, or about 1 per cent of the steam equivalent for a high-pressure turbine carrying the same load. These pumps, of course, exhaust into the turbine. By conserving all the exhaust heat possible, the admission of high-pressure steam to carry the load can be reduced to a minimum, and the cost of generation reduced to practically the investment charges and maintenance.

If we assume a case of a 500-kw. turbine, operating with 15 per cent additional high-pressure steam, at 20 lb. per kw.-hr., the total high-pressure steam consumption of turbine and pumps would be about 3 lb. per kw.-hr., or a coal consumption (with 7½ lb. evaporation) of 0.4 lb. coal per kw.-hr. at a cost of 0.8 mill with $4 coal. There would be practically no additional labor, as plants of the type using these turbines must have their boiler rooms adequately equipped with skilled engineers. Turbine maintenance is extremely low, so that it is probable that power can be produced for considerably less than 2 mills per kw.-hr. for fuel, labor and maintenance. The cost of these units is naturally quite high, due to their large size in comparison to high-pressure turbines of similar capacity, but the net savings usually produced are greater than with any other method of making power.

Very often the problem of manufacturing byproduct power is unattractive, due to the design of the process heating units. Often quite high pressures must be carried, so that a non-condensing turbine to exhaust at these pressures is uneconomical. This is especially true if the electrical demand exceeds the steam demand for a considerable portion of the total time. But these conditions can be changed.

A Natural Combination of Industries
But an Unusual One

It Seems Strange That Two Industries That Use So Nearly the Same Raw Material as Lumber and Paper Should Not Be More Frequently Under Single Control—Here Is an Unusual Story of Such a Combination Both Economically and Technically Sound

THE co-ordination of two industries under a single head often results in cheaper production and more efficient operation, especially when there is a common source of raw material. But the production of salable lumber together with various grades of paper by the same organization has not been tried in a large way. That makes this modern plant of the Columbia River Paper Mills Co. doubly interesting.

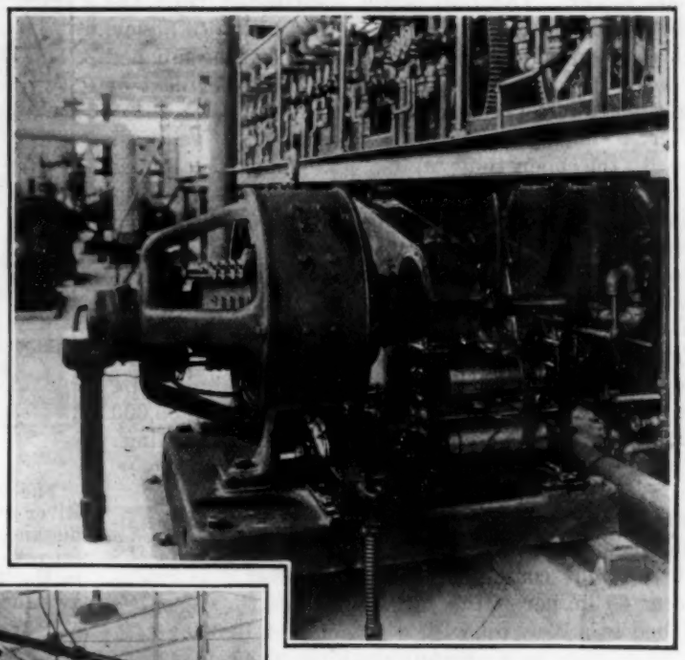
Ample provision for a supply of natural light, for accessibility and permanency of the building were factors that demanded primary attention among possible improvements over common practice in older plants. A steel-frame building was decided upon, the work being placed in the hands of the Austin Co. A special ribbed glass in prism form is used in the windows, which diffuses the light and provides adequate illumination without glare. Not the least of the advantages gained by placing construction of the building in experienced hands was the economy of time that resulted. The work of erection began on Oct. 1, 1923, being completed in 74 working days, or in 16 days less than the time called for in the contract. The building covered a ground space of 392x82 ft. An extension of 100 ft. was then planned and added, this being completed in half the time called for by the contract. The building now covers an area of 492x82 ft. The paper-making machine is housed in a one-story structure, an innovation that has proved satisfactory. The digester house section of the sulphite plant, more than 100 ft. high, is built of interlocking tile, the weight of which is taken by steel framework, at 8 ft. intervals, carried up from the foundation.

The sawmill unit alongside, completed late in October, 1923, has a capacity of about 135,000 ft. of lumber per day. It is electrically operated throughout, great advantage being evident in the ability to cut lumber and paper stock at the same time and from the same log. Hemlock is used almost exclusively, the material of second grade going to the pulp plant in the form of chips. Sawdust, bark and other waste is pneumatically conveyed in pipes to the boiler house, the equipment being furnished by the Pacific Blowpipe Co., of Portland, Ore., a Sturtevant blower being used; the chips for pulp making are carried by similar means to a storage bin placed over the digesters, two of which have been erected, with space available for two more. Each is 49x15 ft., with a capacity of 6,000 cu.ft. Twenty-two cords of wood and about 24,000 gal. of acid make up one charge.

The acid unit was designed by the G. D. Jenssen Co., plan of which is shown herewith. This arrangement insures the production of a strong bisulphite liquor containing a maximum of sulphur dioxide; it also allows the trioxide formed to be washed out before it strikes the limestone, thus obviating the deposition of calcium sulphate.

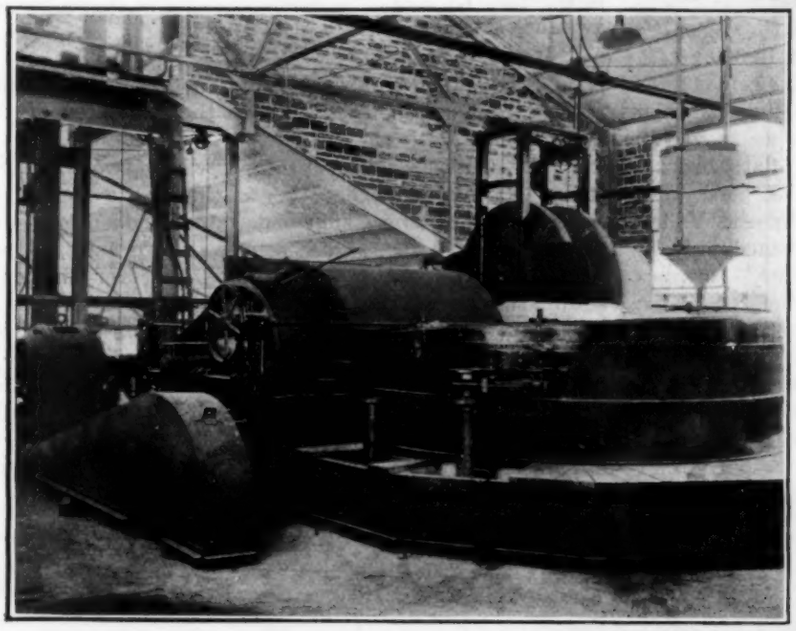
The towers operate with a large volume of water, so that cleaning the grates is unnecessary. After the gases have passed through the first tower they enter the second at the bottom, through a lead pipe. Unabsorbed gases, such as carbon dioxide, nitrogen and oxygen, pass into the air through a pipe in the top of

Forty-four years progress in paper-mill building design. Above: The first paper mill in Clarke County, Washington, built about 1880. Right: The new Austin building, finished in 1924, that houses the plant of the Columbia River Paper Mills. The one-story structure in the foreground contains the paper-making machinery.

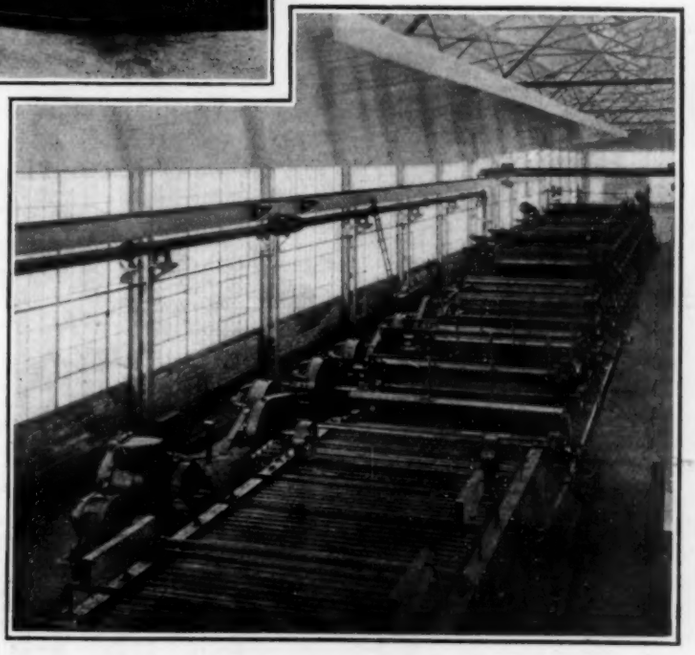


(RIGHT) One of the six motors operating the paper machine. Direct motor connection and electric drive is a feature of the plant. Belting for power transmission is conspicuous by its absence.

(BELOW) One of the three 20x12-ft. beaters at the Columbia River plant, in which the pulp is proportioned and diluted, and mixed with the requisite amount of size or coloring matter (see small suspended tank to the right).



A FEW miles from Portland, Ore., at Vancouver, Wash., is a plant that combines lumber and paper. The paper and pulp unit is modern in every way, with many unusual features such as the utilization of slab and heart of hemlock from the Siamese Twin Lumber mill, the production of all steam from "hog fuel," waste lumber, electrical drive, and modern buildings.



(RIGHT) An excellent example of good planning for the provision of natural illumination: The 212-ft. paper machine at the Columbia River plant. Sufficient space is available in the vacant aisle to the right to house a second paper machine.

the last tower. The feed water distributed from the top of the second tower forms a weak bisulphite liquor, which is pumped into the first tower, where the finished acid is produced, and where from 92 to 95 per cent of the gases are absorbed.

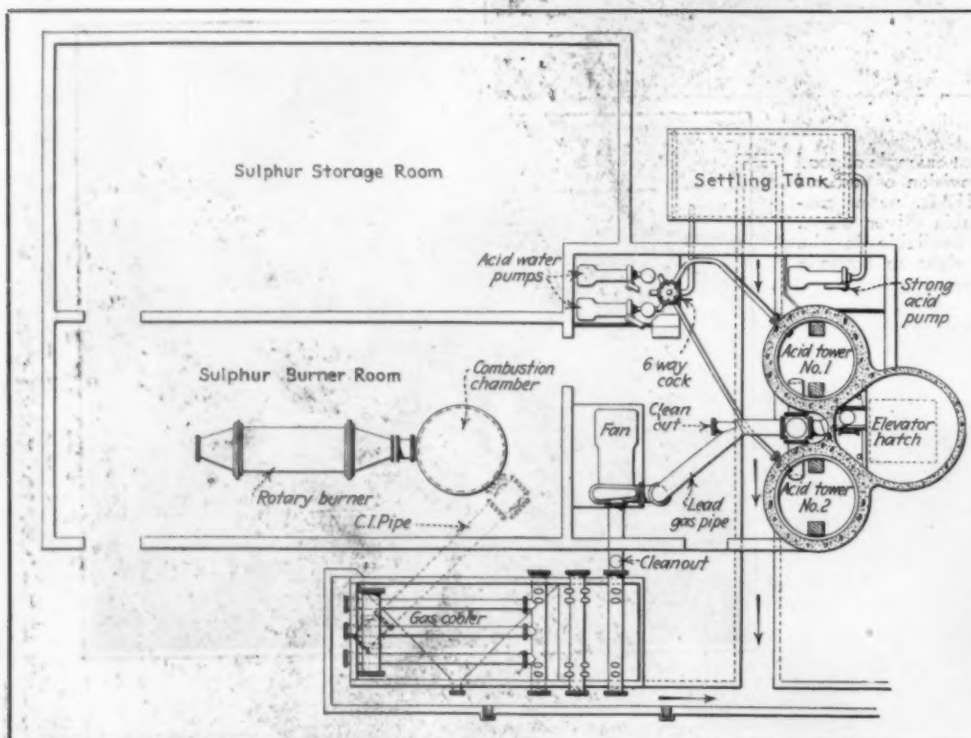
After 3 days of operation the flow of gases is reversed, the operation taking less than 2 minutes. This is controlled from below, as is the feed-water regulation. Limestone charging can be done without interference with operations, a low vacuum being created in the second tower, the exhaust being thus prevented from entering the charging room. The concrete walls of the towers are about 6 in. thick and reinforced. The lining is of acid-proof, salt-glazed tile, imbedded in a mixture of litharge, cement and glycerin. Three acid-storage tanks are provided, each of 50,000 gal. capacity. All the acid-resisting valves and fittings were made by the Rand Iron Works Co., Vancouver, Wash., from the designs of the plant engineer.

Cooking is carried on for about 12 hours, with sulphurous acid testing 5 per cent total, 4 per cent free and 1 per cent combined; digester pressure is maintained at 65 lb. per sq.in. The pulp from the digesters is washed in a blow pit with a capacity of 12,000 cu.ft., going from there to a concrete stock chest, 40x15x11 ft., equipped with an agitator paddle. The pulp is then screened for the removal of knots, which go to waste, then passing over a series of twelve flat, bronze, diaphragm screens, with apertures 0.4 in. long, and from 0.008 to 0.018 in. wide, supplied by the Valley Iron Works of Appleton, Wis. The screened pulp is then divided, part going to a "wet machine," forming laps of 30 to 45 per cent "consistency," the remainder going to deckers that dewater to 15 to 20 per cent "consistency." The pulp from the deckers goes to a stock chest, equipped with paddles. From these it is pumped to one of the Valley Iron Works beaters, each 20x12 ft. Into this beater is added the desired number of laps from the "wet machine" to bring the pulp to an average of about 96 per cent water. Size or coloring is also added at this stage. Time of beating varies from 3 to 6 hours, according to the character of the final product desired.

From the beater the stock passes to two agitator-storage chests in series, thence through a jordan to the mixing box, where sufficient water is added to insure a fluidity of 99 to 99½ per cent water to 1 to 0.5 per cent fiber. Revolving screens are used for the final elimination of débris before the manufacture of paper is begun. The Bagley & Sewell paper-making machine in use is 212 ft. long, space being available for a second unit. The output of paper at present is about 40 tons per day. The entire plant is electrically equipped; Westinghouse motors, 200 in number, varying in capacity from a fraction to 1,000 hp., are used throughout.

Airplane View of Plant

The sawmill unit and pulp-paper plant of the Columbia River Paper Mills, at Vancouver, Wash. In the left-hand distance is the sawmill unit, from which the chips are conveyed pneumatically to the pulp and paper plant, housed in the long building. In the foreground is shown lumber awaiting shipment.



Layout of Sulphite Acid System

The cooking of wood to form pulp is accomplished by a calcium acid sulphite liquor carrying free sulphurous acid. To make this, sulphur is melted in a rotary burner and combustion to a maximum SO_2 content is completed in the chamber shown. The hot gas is conducted through a cast-iron header to a combination spray and submerged type cooler of lead. Suction is maintained on the system to this point, pressure beyond. In the towers the ascending gas is absorbed by a stream of dilute liquor descending over a limestone packing. As is usual in such cases, strong gas first strengthens strong liquor, then in second tower is completely absorbed by fresh water trickling over the stones.

Adsorbent Carbons for Many Industries

A Review of the Literature of This Broad Field Reveals Important Properties of Specific Utility in Many Industrial Applications

By Ralph H. McKee and Paul M. Horton
Department of Chemical Engineering, Columbia University, New York City

WHEN organic matter is decomposed under the proper conditions, the residue obtained is called charcoal. The decomposition is brought about (*a*) by heat, in the absence of oxygen, as in the distillation of wood; (*b*) by strong dehydrating agents, such as sulphuric acid, and (*c*) by certain types of bacterial action.

The residue obtained by heating wood out of contact with air is familiarly known as wood charcoal, whereas that from bones is called bone char. Wood charcoal has been used as a fuel for many centuries, but its more valuable properties were not early recognized. It was used to some extent as a deodorant, and Shenstone (1)* in 1854 is said to have used it in a respirator, the forerunner of our modern gas masks. Charcoal was used in the early stages of sugar refining as a clarifying agent, being replaced later by the more active products, bone char and blood char.

Only during the past few years have the latent possibilities of charcoal been recognized and their development begun. However, with the technical advances already made, coupled with the improvements certain to result from research, we can soon expect to have available, in large quantity, products not only much superior to animal carbons but performing services until recently believed impossible. Charcoal will ultimately be "mordanted" to serve a number of very important specific uses in the different industries.

The term "char" when used alone in this article will be taken to mean vegetable charcoal unless otherwise modified. Vegetable charcoal is, however, a generic term that requires further limitation, chiefly with regard to source and method of preparation. This is indicated in the following table:

Natural char		Anthracite coal, graphite, etc.
Artificial char	Hard	Sugar charcoal.
		High-pressure wood charcoal.
		Coconut hull, fruit-pit char.
		Coke from coal, oil, etc.
		Vulcanized fiber char.
	Soft	Ordinary wood charcoal.
		Cane bagasse, corn-stalk char.
		Low-temperature lignite char.
		Oil-shale char.
		Rice hull or straw char.
		Charred wood extracts.
		Molasses char.

The natural chars will not be considered further, as they are not suited for activation as decolorizers. The manufactured chars are all artificial and relatively inactive as usually produced. The crude char must be treated by special methods in order to develop any of the general properties of decolorizing effect, gas adsorption, metal adsorption or catalytic effect.

Increasing any one of these properties is called "activation" of the char. From some of the recent literature one might be led to infer that activation of carbons refers only to gas adsorbents. These are relatively unimportant as compared with the decolorizing and clarifying carbons, both industrially and scientifically, and there is no occasion for limiting the broad meaning of the term activation to the specific class of gas adsorbents.

According to the uses of the activated char we have the three general classes:

(1) *Gas Adsorbents*—Usually prepared from the hard artificial chars. Most efficient in taking up noxious fumes, odors, hydrocarbon vapors, etc.

(2) *Color Adsorbents*—Usually prepared from the soft artificial chars. Most effective for decolorizing and clarifying solutions of dyes, oils, vegetable extracts, sirups, acids and as gas reaction catalysts.

(3) *Metal Adsorbents*—Soft artificial char. Used in removing gold, silver, platinum, etc., from solution.

It seems impossible to develop two of these general properties in the same char—for example, a good decolorizing char is only a moderate gas adsorbent and vice versa, although the essential difference in the two classes seems to be one of structure and not a difference in the form of the carbon. Furthermore, a metal adsorbent is usually a poor decolorizer. Decolorizing power and catalytic effect in certain gas reactions seem to be functions of the same general property of the carbon.

It can be shown that acid treatment of a metal adsorbent converts it into a decolorizing char. This indicates that the two classes are structurally identical. The decolorizing chars differ greatly in structure from the gas adsorbents and we know of no simple means by which they may be transferred from the one class to the other. The discussion to follow will deal with classes (2) and (3) only.

Adsorptive Properties

If we eliminate gaseous adsorption together with inorganic adsorbents such as aluminum hydroxide or fullers earth, the literature on the theory of adsorption is fairly limited. The earlier experiments with chars were largely made with blood charcoal, bone charcoal and leather char—that is, materials mainly of animal origin. The effect of the materials associated with the char was not generally considered, although this is often the chief factor in deciding the value of a char for a given purpose. The effect of the mode of activation upon the chemical and physical properties of the char has been overlooked in other cases. Bartell and Miller (2) have carried out the only experiments on a char of unquestioned purity and arrive at some important conclusions. However, commercial chars are never pure

*Numbers refer to references at the end of the article.

carbon, hence the only safe method of approach is to know the history of the char. That will be the viewpoint throughout this paper.

The adsorptive properties of activated char are probably due to the same fundamental form of carbon, irrespective of the source of the char. These properties are to a considerable extent promoted or retarded by the presence of associated mineral matter fortuitously present or added. The effect of chemical reagents depends on whether they are added before charring or are used in treating the crude primary char. In the category of such reagents must be included the atmospheric gases and the products of decomposition of the bodies present in the raw material.

Almost any vegetable substance can be converted into a decolorizing char. Thus we find mentioned in the patent literature, pine, birch and other woods, corn husks, cobs, stalks, cane trash, bagasse, peat, lignite, rice hulls, molasses, slop from alcohol, extracts in paper pulp manufacture, ivory-nut shavings, oil shale, etc. It will be noticed that all of these materials fall in the class yielding soft, artificial chars. There is consequently loss in handling due to shattering and crushing. The production of a mechanically strong char is one of the present-day problems.

> It is easy to get a distorted picture of the industrial significance of activated carbon. Lately our attention has been so focused on the striking progress made by the gas adsorbents that we may have lost sight of the relatively greater importance of decolorizing and clarifying carbons. This series of articles deals with what is virtually a new class—the carbons peculiarly adapted for metal adsorption and in particular the adsorption of gold and silver from their solutions as these are obtained from the ores by hydrometallurgical processes.

Activating Vegetable Chars

The animal chars are fairly active in the primary form and may be used with no further treatment. Thus bone char was for many years considered as a unique substance—a belief that prevented progress in the development of the vegetable chars. As it contains considerable nitrogen and calcium phosphate, the decolorizing effect was ascribed to these compounds (3), (4), (5). The first attempts to produce active vegetable chars thus involved the addition of nitrogenous substances and phosphates to wood or peat followed by the calcination of the mixture (6), (7), (8). This idea has been shown to be erroneous, as the nitrogenous bodies simply control the form in which the carbon is deposited (22). From this standpoint the nitrogenous substances may be considered to fall in the class of accelerative reagents. In short, bone char owes its decolorizing power to the same form of carbon as occurs in wood charcoal. Mixing sawdust with fish scrap, bone oil, casein, phosphates, etc., will yield an active char only in so far as the added material affects the form of the deposited carbon.

Added materials may be listed according to their chemical or physical effects as follows:

(*a*) Those that act as dehydrating agents and bring about the decomposition at a very low temperature, and cause the decomposition products to be evolved as water rather than as hydrocarbons. Among these may be mentioned zinc chloride, magnesium chloride and sulphuric acid.

(*b*) Those that provide a framework or skeleton for the deposition of carbon, protecting it from the cracked products of decomposition, and when dissolved out leave a porous mass of active char. Some materials as rice hulls contain a large proportion of silica in the natural state, whereas others require the addition of such substances as sodium chloride, sulphate and silicate, calcium acetate, carbonate, phosphate and sulphate or even silica itself.

(*c*) Those that have a chemical action on the products of decomposition, rendering them soluble or allowing them to escape freely. This prevents clogging of the pores and deposition of inactive carbon. Perhaps substances of this class are preferentially adsorbed by the active carbon liberated. The most notable substances in this class are the strong bases, as sodium or potassium hydroxides or carbonates (9), (10), (11).

In the case of bone char, conditions of classes (*a*) and (*c*) are met by the substances present in the bones. The carbonate and to some extent the phosphate of calcium dissolve in dilute acids, exposing the carbon surfaces. The decomposition products of the cartilaginous substance do not crack appreciably and are freely evolved. Rice hulls, which contain very little nitrogen, yield a char that contains up to 50 per cent of silica and the primary char may be activated by boiling with 20 per cent of sodium hydroxide. The silica present fulfills condition (*b*) and possibly (*c*). However, in the case of pine wood, corn cobs or bagasse, it is evident that none of these conditions is met naturally. Hence, one of the addition agents must be used unless the primary char is to be activated by one of the processes to be considered later in this discussion.

A New Type of Char

Nothing has been said as to the kind of char produced by the various addition agents, although it is known that two distinct kinds of char may be produced. If those substances that volatilize under 400 deg. C. are excluded, it will be noticed that those most effective are of the type of zinc chloride or magnesium chloride—in other words, acidic bodies. Chars made in the presence of such compounds are active as decolorizers and need no further treatment except a thorough washing with water. On the other hand, sodium carbonate, potassium hydroxide or calcium oxide yield chars that are not very active if simply washed with water. However, by acid treatment they become approximately as effective as the best zinc-chloride char. Hence we may subdivide impregnating agents into those of acidic and those of basic nature. Chars made with substances in the first class are active color adsorbents as made, but chars made with basic materials require an acid wash to develop the activity. This is entirely aside from the extraction of the mineral filler by the acid as a solvent. The condition of the char is actually changed.

Decolorizing chars are, as a rule, either neutral or acid washed, since they are commonly used in solution in which the color exists as an acid radical. The chars made with alkaline agents will likely prove valuable in certain types of work in which an alkaline condition is required, although this point has not been settled experimentally. They have been shown to be the most

efficient metal absorbents thus far discovered. This point has not been stressed before, hence the properties of the alkaline activated chars deserve, and will receive, full discussion in a later paper by the present authors.

The remaining methods of producing activated char, of either the adsorbent or gas type, are based on the theory that the primary char obtained by heating vegetable matter is inactive, because the active carbon at first set free is coated over, or gas treated, by the decomposition products at higher temperatures (12), (13). Also active carbon is set free in only a limited range of temperature, preferably below 600 deg. C. This explains the value of addition agents that promote decomposition at lower temperatures. Gas coke, gas black and graphite, being formed at high temperatures, are not subject to activation.

In order to eliminate the coating of inactive material, selective oxidation of the primary char, by either air or mixtures of air and carbon dioxide at about 400 deg. C., or steam at 900 to 1,000 deg. C., is resorted to. If the decomposition products are oxidized during the period of carbonization, they do not become stabilized and the best chars are probably made under slight oxidizing conditions throughout the time of heating.

The adsorbed complexes have been removed by solvents with some success. (U. S. Pat. 1,423,231 claims the use of selenium oxychloride for this purpose.) Such ordinary solvents as benzene or gasoline are of no value for this method.

Coates (14) activated charcoal simply by heating it to 1,200 deg. C. for a prolonged period. The method attempted to volatilize the hydrocarbons adsorbed by the active carbon. It is believed that any activation so obtained is due to infiltration of air (2), (22). Moreover, the temperature employed would tend to decrease the activity due to the transformation into inactive or partly graphitized form of carbon. Herbst (15) has given perhaps the only indication of this change in his study of the change of electrical conductivity of charcoal with temperature. At 1,150 deg. C. the conductivity changes very rapidly (16).

The production of a decolorizing carbon by selective oxidation appears to be an exception to the rule that decolorizing chars are acid treated. However, an oxidized char is extremely sensitive to acidic conditions, and unless the char is protected by an alkaline ash the adsorption of carbon dioxide or other acidic constituents of the furnace gases during cooling is usually sufficient to bring about the necessary changes. This point is brought out clearly by the experimental work of Bartell and Miller (2) and is indicated in the technical practice (17) of quenching charcoal while hot in order to increase the metal precipitating power. One of the functions of an alkaline impregnating agent in the production of a metal adsorbent char may be to protect the char from the influence of acidic substances during the time of cooling. However, an air-oxidized char is not converted into a metal precipitant by boiling with a solution of sodium hydroxide, hence the effect of the alkali is something more than to act as a buffer material.

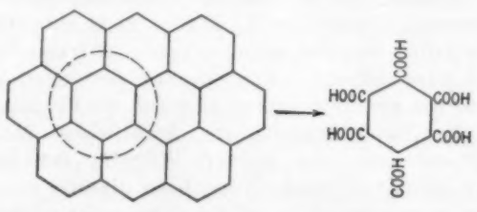


Fig. 1—Oxidation of Carbon Complex to Mellitic Acid

Structure of Active Charcoal

Previous to 1913 Coates had reached the conclusion that low-temperature distillation of wood was necessary to the production of an effective decolorizing char. Chaney's theory (12), derived from the results of experiments made during the war, may be considered as an interpretation of the same experimental fact. Empirically, then, we may conclude that first stage charring at low temperature is an established necessity. What is the nature of the product so obtained?

Cross and Bevan (18) stress the fact that low-temperature charcoal may hardly be considered as a form of carbon. They propose the term "pseudo-carbons" for products obtained, for example, by the action of sulphuric acid on sugar. Verneuil (19) has shown that when oxidizing agents, such as sulphuric acid, act on wood charcoal, the products obtained are not those we get with pure carbon. He isolated mellitic acid $C_6(COOH)_6$ and pyro-mellitic acid $C_6H_2(COOH)_4$ from the reaction products. The char used showed the analysis $H_2 = 2.55$ per cent, $O_2 = 8.38$ per cent and $C = 87.62$ per cent. Charcoal that had been heated to a white heat was not acted upon. Meyer (20) concluded therefore that the mellitic acid is a product obtained from the hydrocarbons present, since the yield varied from 40 per cent to 0 per cent as the temperature of heating was increased. Although the amount of hydrogen present in wood charcoal is more than sufficient to account for the yields from the low-temperature char, it remains to be explained why the yield falls to zero with the char heated to a white heat. Such char is shown to contain up to 0.6 per cent of hydrogen, which is sufficient to give a 25 per cent yield of mellitic acid.

It is believed that the real explanation lies in the oxidation of the carbon complexes, as shown in the sketch in Fig. 1. It is evident that the decreased yield of mellitic acid cannot be ascribed simply to the loss of hydrocarbons on heating. The zero yield with highly heated char is probably a function of the changed carbon linkages that also account for the change in density, greater resistance to oxidation and less adsorptive power. The modification of charcoal produced at higher temperatures likely bears the same relation to the low-temperature form that the modifications of such products as alumina and ferric hydroxide produced at high temperatures bear to the forms obtained at low temperatures. These substances undergo a similar change in crystalline form, density and the adsorptive power. It will be shown in a later paper that low-temperature chars act very much like colloids and may be coagulated from suspensions by the addition of acids.

It is believed that the active form of carbon simply represents an unorganized or less complex state of free carbon, whereas that set free at higher temperatures at once assumes a stable arrangement due to the greater energy conditions existing at the moment of decomposition and hence is inactive as an adsorbent. There is some evidence for believing in a third form of carbon in addition to that of graphite and diamond, but not more, as would be required to explain the existence of an alpha and beta form of the so-called amorphous carbon. However, the deviations among

the forms of diamond, graphite and purified charcoal with regard to their physical properties is almost sufficient evidence. Copisarow (21) comes to the same conclusions, although his work is highly speculative, through a study of the possible molecular configurations of carbon.

The following include most of the more important patents refered to in this discussion:

PATENTS

(1) Mumford, U. S. Pats. 1,286,187; 1,287,592; 1,314,203; 1,314,204; 1,359,094.
(2) Weinrich, U. S. Pat. 1,308,826.
(3) Zerban, U. S. Pat. 1,290,002.
(4) McKee, U. S. Pats. 1,133,049; 1,372,971.
(5) Demme, U. S. Pat. 1,249,041.
(6) Knopfelmacher, U. S. Pat. 1,358,162.
(7) Ostrejko, U. S. Pat. 1,362,064.
(8) Meister Lucius & Bruning, D. R. Pat. 371,691.
(9) Zelistoff Fabrik Waldhoff, D. R. Pat. 309,155.
(10) Degener, D. R. Pat. 44,063.
(11) Zelniczek, Austrian Pat. 3,718.
(12) Bonnard, Holl. Pat. 3,149.
(13) Hudson, Brit. Pat. 139,156.
(14) Eastick, Brit. Pat. 136,873.
(15) Hayasha, Brit. Pat. 121,035.
(16) Leadbeater, Brit. Pat. 122,698.
(17) China Sugar Co., Brit. Pat. 124,638.
(18) Tai-Koo Sugar Co., Brit. Pat. 125,230.
(19) DeBruyn, Ltd., Brit. Pat. 162,117.
(20) Penrose, Brit. Pat. 122,465.
(21) Shilstone, Brit. Pat. 116,253.
(22) Inada, Jap. Pat. 35,876.
(23) Swzuki, Jap. Pat. 34,755.

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(2) Bartell and Miller, *J. Am. Chem. Soc.*, vol. 44, p. 1866; vol. 45, p. 1106 (1923).
(3) Wallace, *Proc. Glasgow Phil. Soc.*, vol. 6, p. 377 (1865).
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(6) Facilides, *Arch. Pharm.*, vol. 141, p. 121 (1870).
(7) Von Melsens, *Pol. Notizbl.*, vol. 30, p. 281 (1874).
(8) Zerban, *Bull.* Louisiana Exp. Sta., No. 167.
(9) Bonnet, *Chem. Age* (N. Y.), vol. 31, p. 372 (1923).
(10) Peck and Adams, *Louisiana Planter*, vol. 61, p. 395 (1918).
(11) Daude, *Z. Ver. Deut. Zuckerind.*, vol. 71, p. 13, (1921).
(12) Chaney, *Trans. Am. Electrochem.* Soc., vol. 36, p. 91 (1919).
(13) Ray, *Chem. & Met.*, vol. 28, p. 977 (1923).
(14) Coates, *Bull*, Louisiana Exp. Sta., No. 161.
(15) Herbst, *Biochem. Z.*, vol. 115, p. 204 (1921).
(16) Phillips, *J. Chem. Soc.*, vol. 117, p. 362; vol. 118, p. 699 (1920).
(17) Edmands, *Bull.* Inst. Min. & Met., London, March, 1918.
(18) Cross and Bevan, *Phil. Mag.*, vol. 13, p. 325 (1882).
(19) Verneuil, *Compt. rend.*, vol. 132, p. 340 (1901).
(20) Meyer, *Monatsch.*, vol. 35, p. 163 (1914).
(21) Copisarow, *Chem. News*, vol. 118, p. 310 (1919).
(22) Horton, *J. Ind. Eng. Chem.*, vol. 15, p. 519 (1923).

Research in Europe

The Status of National and Industrial Research in England, France, Czechoslovakia and Germany

"RESEARCH IN EUROPE" was the topic of a paper recently delivered by Maurice Holland before the Division of Engineering and Industrial Research, National Research Council, of which he is director. In a comparison of the research organization, both national and industrial, in England, Germany, France and Czechoslovakia he brings out salient features in the system of each country.

In England the Department of Scientific and Industrial Research has established co-operative associations in the principal industries—twenty-six in all—with successful results in all but one or two instances. A fund of $5,000,000 was made available 6 years ago to subsidize the research activities of any industry over a period of 5 years to the extent of 50 per cent. After that period the industry is expected to be in a position to conduct its own investigations.

Among these research associations may be mentioned: the British Cotton Industry Research Association, supported by 1,700 members, or 95 per cent of the producing industry, with an annual budget of about $225,000; the Leather Trades Research Association, supported by 139 companies representing 50 per cent in number and 70 per cent in production of the industry; the Launderers Research Association, with 500 member companies (70 per cent of the producing industry); the Research Association of British Rubber and Tire Manufacturers, with 14 members, comprising 90 per cent of the tire industry and 70 per cent of the entire rubber industry and a budget of $40,000.

PRIVATE RESEARCH ORGANIZATIONS

In addition many of the industrial plants have private research organizations, some remarkably complete, as for example that of the General Electric Co., at Wembley, with a staff of 126, including 18 scientists and 25 technical men, and an annual budget of $200,000.

According to Jasper Crane, European representative of the du Pont company, the English chemical industry as a whole does not appreciate the value of research as the American industry does. There is no associated or co-operative research on account of the great competition and the intensive development of alleged trade secrets. From a research point of view, the larger English concerns rank about as follows: Nobels (annual budget $300,000, of which 39 per cent is expended on pure science research), Brunner Mond, British Dye Stuffs and British Alkali companies. One of the smaller concerns, Scottish Dye Stuffs Co., is doing more thorough research on dyes than any other in Great Britain.

The Anglo-Persian Oil Co. maintains a research laboratory at Sunbury with an annual budget of $100,000 and a staff of 25 scientists conducting fundamental investigations of lubrication and automotive fuels. Sir John Cadman, managing director in charge of refineries and research, said in summing up research activities in the oil industry: "Practically all research is done by the Anglo-Persian, Royal Dutch, Shell, and Scottish Shale Oil companies, representing 90 per cent of the producing industry."

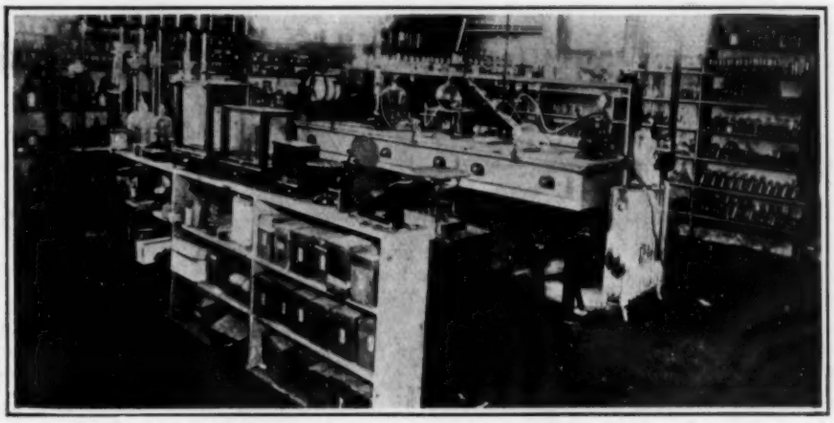
In Czechoslovakia the outstanding research activity is that conducted by 168 concerns representing 95 per cent of the entire beet sugar industry. Housed in modern quarters with ample facilities, this organization has been instrumental in assisting its industry very greatly. An annual congress of the technical and business leaders of the industry is held when the results of the year's investigations are made known.

GOVERNMENT AID IN FRANCE AND GERMANY

One feature of the French national system under the Ministry of Public Instruction is the plan whereby an individual worker may obtain government laboratory facilities provided his project appears sound. A percentage of royalties is returned to the government to defray actual costs.

The German system remains essentially unchanged, with research founded in the state. It is subsidized in every possible manner—and accent is frequently on work in pure science. Prussia has developed its research to the greatest extent through its Physikalische Technische Reichsanstalt, its Staatliches Materialprufungsamt and the Kaiser Wilhelm Gesellschaft. Recently industrial research has been directly concerned with the improvement of existing processes rather than the development of new ones.

Two Million References Easily Accessible



A CARD INDEX of more than 1,800,000 references to United States chemical and industrial patents issued since 1900 arranged alphabetically under approximately 9,800 headings is the distinctive feature of the technical library of the Edward C. Worden Laboratories at Milburn, N. J. The index is open for consultation without charge during office hours by appointment. Arrangements can also be made to obtain typed lists bearing on specified subjects.

No expense has been spared, no detail overlooked in making these files thoroughly accurate and reliable. As a consequence a search that would ordinarily require days may be completed in a few hours. Recognizing that an index of patents alone will not necessarily suffice in searches to determine the validity or lack of novelty of proposed patent claims, periodical chemical literature is completely abstracted as published. The list of journals reviewed in this way, sixty in number, comprises practically all of the significant contemporary literature of the world in the fields covered.

Especial attention is given in making these abstracts to note mention of foreign patents. In one master volume lists are made up giving the numbers and countries in which all such patents originate. These are keyed to the journal from which the reference is taken to facilitate subsequent searches. The foreign journals are filed by years in the library, as are the references in the master foreign patent book.

The system employed in handling United States patents in building up the card index that has already been mentioned is necessarily complex. Explanation may be useful, however, as a similar system might be employed on a less elaborate scale by any individual or concern having occasion to file similar data in such manner that they be available upon a moment's notice. Each week the *Official Gazette* of the United States Patent Office is reviewed and every patent is ordered that might involve any chemistry whatever. On an average 300 such patents are issued each week. Upon arrival these are reviewed by a competent chemist, who makes in duplicate on colored paper a double column of entries. In one column every process, operation or product is listed, in the other entries are made indicating every material employed in obtaining the results claimed. Whenever two names for the same compound are mentioned, as "carbona" for carbon tetrachloride, a special entry is made for the synonym file that is an adjunct to the index proper.

The two original colored paper analyses for each patent are next sent to a stenographic corps, where cross-indexes are made in the following fashion:

Process, Operation or Product	Materials Employed	Process, Operation or Product	Materials Employed
A	1	*D*	4
B	2	*E*	5
C	3		

The cards used are 3x8 in., bearing in addition to the patent number such entries as A1, A2, A3, A4, A5 . . . E1, E2, E3, E4, E5, etc., that are made on colored slips pasted to the cards. Sometimes as many as 3,500 cards have been made for a single patent, requiring the services of a typist for an entire week. When the cards are complete they are arranged alphabetically and filed in a fireproof vault. The color of the pasted slip is characteristic of the year of issue and of course corresponds to the original analysis that is filed in the vault with a copy of the original patent.

In conjunction with these files and the library of 20,000 volumes—probably the finest private collection of chemical literature in this country—laboratory and semi-industrial equipment is maintained for carrying on original research. Although specializing in the field of cellulose esters, facilities have been developed for carrying on chemical investigations of all kinds.

Readers' Views and Comments

An Open Forum

The editors invite discussion of articles and editorials or other topics of interest

Chemical Ingenuing Takes the Defensive

> "Keep out, keep out, or else you are blown up, you are dismembered, Ralph; keep out, for I am about a roaring piece of work."—*The Tragic History of Dr. Faustus.*

To the Editor of Chemical & Metallurgical Engineering:

Sir—May we impose upon you and your indulgent readers to present a brief apology? But first we wish to thank R. G. Erwin for his letter in the Dec. 15 issue. We have been curious to discover what reaction our precocious nonsense might catalyze; and we are pleased to learn in what particulars it incurs dissent.

If we interpret correctly, the charge is that we have fallen a victim of the machinations of the more benevolent of the Bishops Nathan and Mencken. The proof is an incriminating sentence, and the intent—presumably—to rescue us from bartering our soul to the devil.

Unfortunately, what has been so simply and directly said is so omniscient as to necessitate many labored paragraphs for an adequate reply. In fine, we must expound ourself—pretentious and cumbersome as may be. May we plead that our essays had not a new idea to present, and that we were void of any ability to represent the hackneyed old ones in a new language. But as we were convinced of the importance of certain considerations, we fondly sought a subterfuge to render them more comely. We employed an inverted viewpoint in the hope that orienting the old problem might render its contemplation less monotonous and repugnant. We justified the means to the end by imagining that the thing was obvious.

For our purpose we sought a style suited to the subject—one that escaped being either facetious or pedantic. Being of no very great inventiveness, we were forced to borrow from right and left and, for the most part, to essay a style that was a mongrel parody of those of H. L. Mencken and J. B. Cabell. To these two we added various portions from other thaumaturgists and even here and there hazarded what was, so far as we knew, an original rhetorical effect. If we succeeded in the essayed burlesque, we feared that pointing it out would be equivalent to daubing a red rose with barn paint lest bypassers should mistake it for a sunflower. If we had failed, the less said about it the better.

But that we were seduced by an accidentally Hussey-inspired perusal of the third series of "Revelations" we are forced to deny. At this point we apparently drew across our trail a herring in the form of a sentence discussing the duty of a man with an idea. It parallels, almost identically, one of his Honor's inspired deliveries. Hence we are an animalcule—or at best a zealot spattered by the chariot wheels of a passing Prince of Baltimore.

We recall reading Mr. Mencken's "On Being an American," but whether in *Smart Set* or "Prejudices" we are unable to say. The bruited sentence stuck; it was sonorous and dextrous. But in self-defense we are persuaded to point out that we also definitely recall reading the same subject discussed from the same viewpoint in almost the same words (the sentence in question) in writings by Samuel Butler, Samuel Clemens, Steve Leacock, E. A. Poe, Arnold Bennett and Theodore Roosevelt. Unfortunately, we do not remember these references any more than we remembered Mr. Mencken's. But all these and unremembered others were what we drew on in writing the passage in question. And what threw the wording almost identically into Henry L.'s was undoubtedly our conscious effort to parody his luxuriant and admirable style.

If plagiary is the moot point, let us not overlook that his Highness is fond of starting out "My guess is" or "I am forced to send out a word of protest" and ending up by dropping a pearl of wisdom, or a *Schnitzel* of something or other, and passing on. In self-defense, and to show the inescapability of Mr. Mencken's influence on the vernacular, we deprecatingly call attention to the fact that from start to finish Mr. Erwin's contribution is rampant with Menckenisms. And in our unstarred umbra (Mencken) we venture to opine that Mr. Erwin intended no plagiary or false assumption of laurels, but chose these expressions because they fitted the subject at hand so irresistibly. Our only regret is that we bungled the attempt to convey the same impression in our own poor script.

But perhaps hypnosis, not plagiary, is the diagnosis. If this is the case we have to repeat what every critic (S. P. Sherman excepted) has been reiterating for 5 years. There are two classes of readers who enjoy the Maryland Wizard: those who consider him an infallible fount of knowledge—to his own amusement; and those who find much that he says unswallowable by the grossest dilation of the gullet, but assiduously peruse his spicy *Katzenjammer* because it is refreshing. We read him faithfully and with the greatest enjoyment, for we believe that whoever brings an intelligent attack against established precedent renders a valuable service, whether his spoutings are valid or not. Such criticism induces a reviewing of our conventions and either strengthens or destroys our infatuation. It brings about a sorting out of the chaff, what ordinarily passes because it did so this time last year. And so we say, with amiable Chris Morley, that a cause is more apt to be injured by excessive and injudicious praise than by savage and churlish criticism.

We welcome Mr. Erwin's comments, even though we cannot entirely agree with his dicta. We apologize for not embracing what we can conceive as a tenable hypothesis; but we are rather hopelessly bedraggled with our own ideas. What we regret is having to request the editors of this excellent journal—devoted to reporting and discussing technical progress—to turn its pages into a literary debating society. We are too greatly indebted to them for the space and favors granted our unpretentious offerings to impose thus upon them more than once. For this reason we must let this subject rest here; nor can we again return to it.

But while we are engaged in discharging obligations to our unconsulted collaborators we would pause to say a word of a book called "The Humanizing of Knowledge." It is to James Harvey Robinson that we must give credit for anything not entirely unconsiderable in

either of our essays. True, we might liken ourself to an earthworm turned by so many plows that it sets itself up as an authority on agricultural economics; but it was chiefly Mr. Robinson's booklet that impressed us with the gravity of the scientist's problem. The thing resolves into two simple statements. The public misunderstands science. The scientist misunderstands the public. And who can say if the hen, or the egg, precedes? One who is acquainted with the nature of misunderstandings is apt to suspect delinquency of both contributors. And one whose intentions are least arguable is apt to examine his own sufficiency before too certainly proclaiming another's default. The scientist's task, we guess, is to look well to his own vulnerability before he elects a very formidable foe.

As a very imperfect, and hence excellent personification of this abstruse character—the scientist—we look around and find intelligent, well-educated and unbiased people who consider the scientist a delinquent—who consider me responsible *and to blame* for my own destitution. And we are inclined to believe that they are right. We find a note in "Straws and Prayer Books" which says: "How, then, can we consider Plato's conduct anything but ridiculous—since he appears to have written his laws, not for men who have a real existence, but rather for a set of persons invented by him."

Samuel Butler writes "Erewhon"; Mr. Robinson dares to say: "This is the supreme problem of our age and no one can hope to do more than to make a modest contribution to its solution." To which Theodore Roosevelt aptly adds that the man who aspires higher than a bric-a-brac collector can do no less.

CHEMICAL INGENUE.

An Organization for Soap Technologists

To the Editor of Chemical & Metallugical Engineering:

Sir—During the period the discussion of a trade association among soap manufacturers, initiated by *Chem. & Met.*, was proceeding in the columns of your valuable journal (March 24, 1924, p. 461; Sept. 15, 1924, p. 433; Oct. 13, 1924, p. 591), a committee on detergents was in process of formation within the American Oil Chemists Society. This committee is now functioning and at the present moment discussing subjects and plans for co-operative research.

The American Oil Chemists Society is the direct successor of the Cottonseed Products Analysts. The latter society was formed because of the great need of standardization of rules and methods and for research along basic lines in which all were interested either directly or indirectly. The success of the Cottonseed Products society was so marked along its special lines that it was felt that its activities should be broadened. Among its members there were persons engaged in almost all lines wherein oil and fat technology was basic.

The American Oil Chemists Society has been working toward this broad policy for some years and a determined effort is being made this year firmly to establish energetic and producing committees along the lines which have been so beneficial in cottonseed products. "Energetic and producing committees" is used advisedly, as our committees have always been of this character and not of the usual type of desultory exchange of a few letters with no final decision based on actual data and full discussion.

Besides the detergents committee mentioned, the fats and oil committee and the committee on imported fats and oils and oleaginous materials will shortly be in full swing, and others as the need or interest may develop. Thus, with all lines and shades of fat and oil technology represented and active work progressing, the benefits must be obvious to any interested in any line wherein fats and oils are a large item. The association with others outside one's particular field but with basic interest cannot but be of value for a broadening of knowledge applicable to one's special needs.

The active support and co-operation of all is most desirable. A spirit of "wait and see" gets us nowhere except to have our rules, methods and research formulated and conducted by others not familiar with our needs and problems.

J. J. Vollertsen, vice-president and chairman of the membership committee, Armour & Co., Union Stock Yards, Chicago, Ill., will gladly furnish information and application blanks to all wishing to benefit by and assist in the activities of the American Oil Chemists Society.

H. J. MORRISON,
President, A.O.C.S.

Procter & Gamble Co.,
Ivorydale, Ohio.

A Forgotten Wood Distillation Journal

To the Editor of Chemical & Metallurgical Engineering:

Sir—In preparing a bibliography on some of the early literature of wood distillation, reference was found to some articles published in the *Journal* of the United States Association of Charcoal Iron Workers.

Correspondence that developed from an effort to locate copies of these rare volumes brought out the facts that there were formerly more than 300 furnaces manufacturing charcoal iron in this country; that the *Journal* was started in 1880 in Philadelphia with the late John Birkinbine as editor, and that the library of the Franklin Institute has eight complete volumes and a single number of vol. 9.

Recently through the generosity of T. C. Albin, of the Charcoal Iron Co. of America, the writer had the opportunity of examining the first four volumes of the *Journal*. They contain reports upon some of the first, if not the very first, metal retorts used in the United States. Also the efforts of Dr. Pierce of Elk Rapids, Mich., to condense the vapors issuing from the old brick kilns used in his plant are very completely described. From Dr. Pierce's results it was calculated that the yield of methanol and acetate of lime that could be obtained if all the wood-carbonizing plants were to adopt his practice would flood the markets with these materials. Incidentally, while one of Dr. Pierce's papers was under discussion, a member pleasantly remarked that the association was one of charcoal iron workers and not chemists.

At that time a visit to a plant making charcoal and charcoal iron in the State of Minnesota was described as a long and tiresome journey. Several plants were located in the States of Wisconsin and Missouri and one was even to be found in the then Territory of Washington. A roster of members included names of men who were the founders of some of our best-known iron and steel working establishments; also that of former Justice Wood of the U. S. Supreme Court.

Although a complete history of both the association and its journal was not secured, a record of the existing volumes is thought worth while in order to show where some early history of wood distillation and iron smelting can be found, and also in the hope that someone may be led to contribute further information.

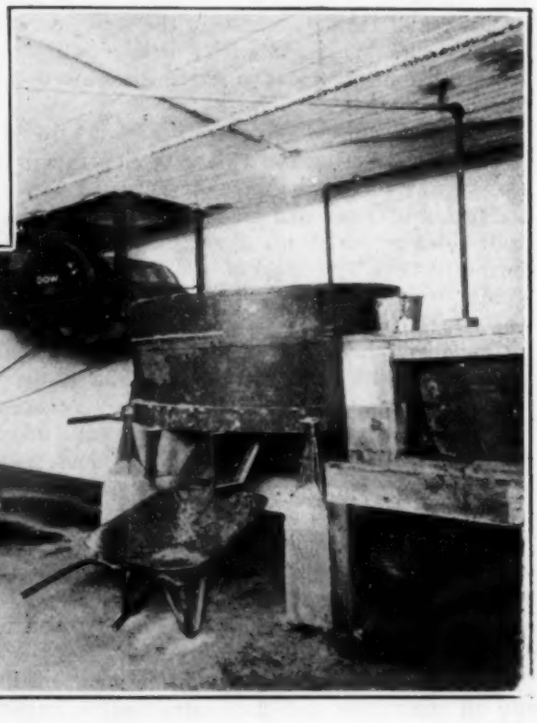
H. N. CALDERWOOD.

Forest Products Laboratory,
Madison, Wis.

This plant had a problem of cooling as well as transfer between two steps in its manufacturing process. So extra wide gravity conveyors to transport the material were installed, thus forming a collecting area between the two operations and slowing the movement up sufficiently to permit the desired cooling. In this case the conveyors not only save much labor but also automatically take care of a necessary step in the process.

Conveyors—Mechanical Hands for Industry

WE OFTEN hear plant managers bemoaning the fact that they, whose plants were built years and years ago, must struggle to compete with newer plants into which have been built all our modern conveying and labor-saving devices. But there is hardly a factory, however old, in which much useless labor connot be saved and great economies of time and money made by the application of a conveyor here and there. The photographs on this page show some applications of this nature.



(ABOVE) The installation of a conveyor through the shipping department such as is here shown does away with much of the unproductive labor that so often attends the removal of the goods from the plant.

(RIGHT) The necessity often occurs for adding some ingredient at a point beyond the start of the process. In the case shown here, a dry product is brought in on a conveyor and fed into a mixer, in which it is mixed with the processed liquid, fed in by a pipe line.

Equipment News

From Maker and User

Profitable Co-operation

By L. H. Sturtevant
President, Sturtevant Mill Co.,
Boston, Mass.

If every executive knew everything, industry would be a one-man affair, employing clerks only to carry out orders and attend to routine. There would be no need of advice, consultation or co-operation, for the one executive would be sufficient unto himself. Fortunately or unfortunately, in reality this superman does not exist, for in our short span of life there is neither time nor opportunity for any one man to acquire the knowledge necessary to make him equally proficient along many lines—in fact, in this age of specialization and systematic fact finding, it is indeed a rare individual who is really expert outside of his own particular and, usually, very narrow sphere. For these reasons the wise executive surrounds himself with experts who possess that knowledge of his particular business which he lacks himself, the result being a well-rounded organization, fully equipped to do business on an efficient and permanent basis, and capable of coping with any matter of usual occurrence.

There are, however, certain problems that arise that are somewhat beyond the knowledge or experience of those within the organization and it would not pay to employ an expert regularly, simply to be ready for such emergencies. Take, for example, the erection of a building. Few people would assume the responsibility of such an undertaking without employing an architect, as it needs special knowledge, training and experience to build efficiently; engineering skill for proportioning; information of the materials available for construction; and the knowledge to comply with local building codes, thus avoiding errors which only experience can obviate. The architect earns his fee and the employer saves this expense many times over and is relieved of the responsibility, labor and time which can be used to better advantage in his own line of business.

The principle of employing others for work to which our own organization is unadapted is sound; is widely recognized and is becoming broader in its scope. The old maxim, "If you want work done right, do it yourself," is an exploded axiom and should read, "If you want work done right, employ none but those of known knowledge, ability and experience in that particular line of endeavor."

The average business man knows what he wants to accomplish; the real problem deals with methods. There are usually several methods that can produce the same results, but seldom at the same cost or with equal efficiency. Rarely is the average manufacturer as capable of working out this problem as he is in manufacturing or selling. Such tasks come but seldom and therefore his knowledge and experience is seriously limited; the result, if he works it out himself, is common errors of arrangement and construction, in trying to adapt or in experimenting with that with which he is not familiar, rather than consulting or co-operating with those who make it their business to work out just such problems and who are thoroughly conversant with all equipment suitable for such or similar service. It stands to reason that such an amateur cannot compete with a professional any more successfully than the inexperienced with the experienced. In one case you have the home-made job with all of its inherent defects, the only one of its kind. In the other case you have a duplicate of a successful installation, a proved success, or a modification of known principles with which your risk is minimum.

Value of Consultants

It is not intended herein to convey the thought that you should place yourself literally in the hands of specialists without veto power. Far from it; the experienced expert wants and values your advice, your views, your knowledge and your experience. He consults, co-operates with you and submits a tentative solution of your problem on paper, for discussion, criticism and debate; then he makes a revision of the layout combining the best ideas of all and by the process of elimination finally submits the finished design for your approval. He steers you around pitfalls, shows you short cuts, simplifies, standardizes, is not apt to err on construction details or standard practices —in fact, works as one of your valued employees for mutual benefit.

Men of recognized intelligence in their own line of endeavor are as children when they are confronted by a problem for which they are unfitted from the standpoint of education or experience. A man without mechanical ability is lost and can easily be led astray when there is a mechanical question to be decided. There are mechanics and mechanics, some good, others bad, but even a poor mechanic can convince an intelligent, hard-headed business man, lacking mechanical ability, that he can do something far beyond his education, training or experience—in fact, the ingenious practical mechanic, unguided, is a dangerous asset. The result of his conclusions is usually disastrous. If you think you or your employees are capable of accomplishing certain results, and this is likely to be true, it is wise and costs little to consult an expert in that particular line of work, if no more than to check your conclusions and offer suggestions.

Remember the old adage, "A little knowledge is a dangerous thing." It is a common error to design a building without regard to the equipment to be installed, the result being that equipment must be designed and arranged to fit the structure rather than the structure to fit the equipment. The result is never satisfactory, a makeshift, neither being suitable for the other, and therefore a continuous liability. Thousands of dollars are lost each year by such an obvious mistake.

Another error, widely made, is the lack of understanding of the limits of economical service to expect from equipment—in other words, expecting a machine to do that for which it was not designed and therefore incapable of doing with any degree of efficiency.

The knowledge of known principles and practices and the ability to recognize the right principle to apply and how to apply it to any given service, coupled with the technical as well as practical education of experience to follow successful lines and avoid experimentation and errors, is the benefit derived from employing the services of the engineer by industry.

Pneumatic Accumulators

As on alternative equipment to the gravity accumulators used with large hydraulic press installations, the Werner & Pfleiderer Co., Division of the Baker-Perkins Corporation, 25 West 43rd St., New York, is offering a pneumatic accumulator in which compressed air takes the place of iron or concrete weights.

The makers of this new accumulator claim numerous advantages for it, among which may be mentioned:

1. Saving in cost of erection. No foundations need be built. Less labor and time are required.

2. It may be placed where desired in the plant, because of its small space requirements and comparatively light weight.

3. The space occupied is much less than that for a gravity accumulator.

4. Compressed air eliminates the shocks and jars inherent in the gravity accumulator, thus giving better operation.

5. Much closer regulation of hydraulic pressure is possible than with the gravity accumulator and this with less trouble and expense.

The operation is in general as follows: The pneumatic accumulator consists of the accumulator cylinder, a battery of compressed air storage tanks, an air compressor and a high-pressure pump. In the accumulator cylinder the air is on one side of the piston and the operating liquid, either distilled water or oil, on the other. When the valve on the press is opened, liquid under the pressure of the com-

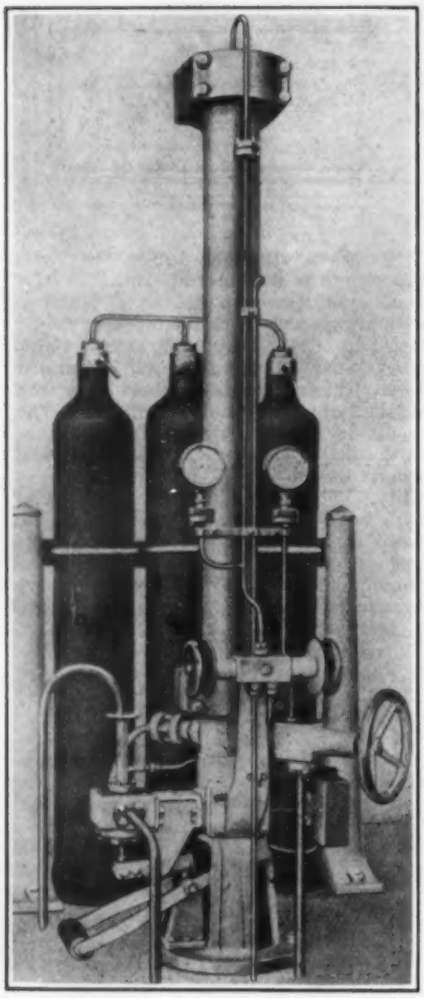


Fig. 1—Pneumatic Hydraulic Accumulator
This device, now in use for operating twelve presses and running at a pressure of more than 5,800 lb. per sq.in., well illustrates the construction described in the accompanying text.

pressed air is withdrawn from the accumulator cylinder. At the end of the press stroke this liquid flows to a tank from which the high-pressure pump forces it back into the accumulator. This action is under the automatic control of an operating valve built into the accumulator. As soon as the pressure in the accumulator cylinder reaches the point for which it is set, the excess liquid is caused to return, without pressure, to the pump tank, to be again pumped back through the system. Thus the pump keeps maintaining the pressure at all times while the press is in use.

Fig. 1 shows a high-pressure installation for working at 400 atmospheres (5,880 lb. per sq.in.) and Fig. 2 gives a comparison between the pneumatic accumulator and a gravity accumulator using cast-iron weights, both for working at 350 atmospheres (5,145 lb. per sq.in.) and similar capacity. These two figures clearly demonstrate the differences between the two types of accumulators.

These pneumatic accumulators are built for pressures from 20 to 600 atmospheres (294 to 8,820 lb. per sq.in.), for any capacity of liquid up to 250 gallons. They are made throughout of rolled steel and constructed so as to insure safe operation.

When the lower pressures up to 50 atmospheres (735 lb. per sq.in.) are used, the air storage cylinders are filled direct from the compressor. For higher pressures, the pressure up to 50 atmospheres are obtained by the compressor and the accumulator cylinder is utilized as a secondary compressor to reach the desired high pressure. This compressed air remains always in the system, the compressor having only to make up losses from leakage and similar causes. Hence a small compressor is used, or in some cases an existing supply of compressed air is sufficient.

Manufacturers' Latest Publications

M. H. Detrick Co., 140 South Dearborn St., Chicago, Ill.—A new catalog of Detrick furnace arches showing their adaptability to industrial furnaces and oil stills as well as to all types of boilers. This catalog is well illustrated with drawings of each type of application and presents the story of the utility of this method of furnace construction in a readily understandable manner.

Davenport Locomotive Works, Davenport, Iowa.—A folder describing steam and gasoline locomotives for industrial service.

Crescent Refractories Co., Curwensville, Pa.—Series 1, No. 8. A new data sheet giving working temperatures of different types of industrial heating equipment.

W. A. Jones Foundry & Machine Co., Chicago, Ill.—Catalog 31. A new catalog of the complete Jones line of power transmission equipment, including shaft hangers, pillow blocks, couplings, collars, belt tighteners, mule stands, etc.

Mesta Machine Co., Pittsburgh, Pa.—A new bulletin describing Mesta forging ingots.

Eimer & Amend, 205 Third Ave., New York City—Bulletin 340. A new catalog of micro-chemical apparatus for micro-analysis.

The Duriron Co., Dayton, Ohio.—Bulletin 135. A bulletin describing improved reciprocating pumps for use where resistance to corrosion or erosion is desired.

Thermo Electric Instrument Co., Newark, N. J.—A new folder describing Freas ovens for testing and laboratory work.

General Electric Co., Schenectady, N. Y.—Bulletin 48732. A catalog describing electric equipment for cranes such as motors, controls, panels, switches, brakes, etc.

Roller-Smith Co., 233 Broadway, New York City—Bulletin 530. A catalog of "Standard" type circuit breakers of all designs such as underload, under-voltage, shunt-trip, interlocked trip, overload, etc.

Adam Hilger, Ltd., 75 Camden Road, London, N.W.1, England.—A 1924 general catalog describing all the manufactures of this firm, including spectrometers, goniometers, diffraction gratings, spectographs, spectrophotometers, micrometers, spherometers, interferometers, spectroscopes, audiometers and other apparatus of this type.

American Schaeffer & Budenberg Corporation.—Berry and South 5th Sts., Brooklyn, N. Y.—Catalog 200. A new catalog of all types of thermometers for industrial use, featuring the "Crescent" line.

Driver-Harris Co., Harrison, N. J.—A leaflet giving data as to the properties, constants, etc. of castings made from "Nichrome."

Hollow Ball Co., Inc., Baltimore, Md.—A catalog of seamless hollow balls of various metals for use in pump valves, check valves, steam traps, float valves, bearings and all other purposes for which metal balls are adapted.

Esterline-Angus Co., Indianapolis, Ind.—Bulletin 1024. A pamphlet describing the use of graphic instruments in the pulp and paper industry.

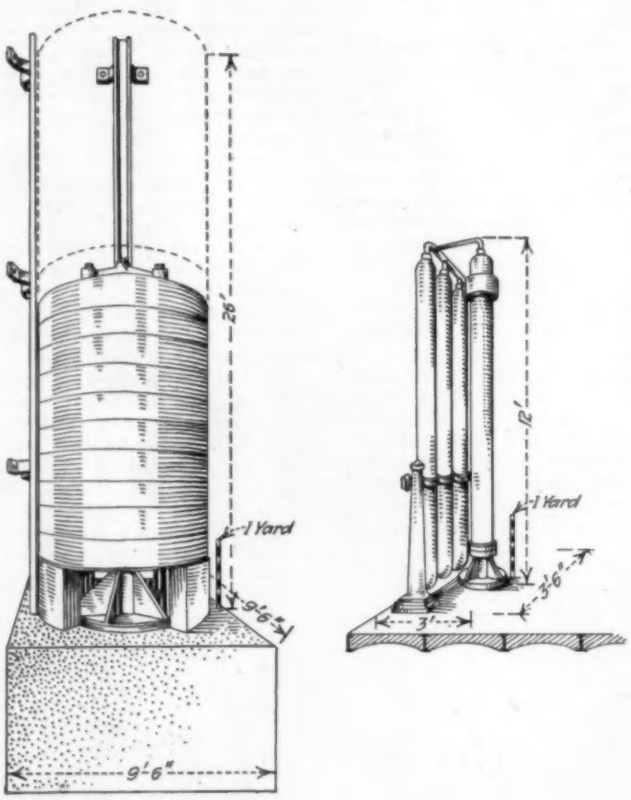


Fig. 2—Comparison Between Pneumatic and Gravity Accumulators of the Same Capacity, Each Operating at 5,100 Lb. Per Sq. In.

U. S. Patents Issued December 23, 1924

Titanium Compound and Its Manufacture. Frank E. Bachman, Port Henry, N. Y.—Re-issue 15,973.

Machine for Treating Rubber and Other Heavy Plastic Material. Fernley H. Banbury, Ansonia, Conn., assignor to Birmingham Iron Foundry, Derby, Conn.—1,520,001.

Level-Indicating Device. Franz Georg Bloch, Boblingen, Germany.—1,520,004.

Machine for Making Asphalt Roofing. Harry A. Cumfer, Chicago, Ill., assignor to Guyton & Cumfer Mfg. Co., Chicago, Ill.—1,520,014.

Alloy. Stuart Eban MacGregor, Windsor, Ont., Canada.—1,520,033.

Process for the Manufacture of Sealing Caps and for Applying Them Onto the Vessels to Be Sealed. Adolf Dulitz, Hirschberg, Germany.—1,520,054.

Apparatus for Evaporating Solutions. Eudo Monti, Turin, Italy.—1,520,069.

Recovering Aluminum Chloride. George L. Prichard and Herbert Henderson, Port Arthur, Tex., assignors to Gulf Refining Co., Pittsburgh, Pa.—1,520,080.

Process of Making Sulphuric Acid. James H. Shapleigh, Dover, N. J., assignor to Hercules Powder Co., Wilmington, Del. — 1,520,093.

Apparatus for the Instantaneous Cooling of Mixtures of Gas and Solids. Roy H. Brownlee and Roy H. Uhlinger, Pittsburgh, Pa., assignors to Thermatomic Carbon Co., Pittsburgh, Pa.—1,520,115.

These patents have been selected from the latest available issue of the "Official Gazette" of the United States Patent Office because they appear to have pertinent interest for "Chem. & Met." readers.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Process of Increasing Efficiency of Distillation. Henry E. Deckebach, Cincinnati, O.—1,520,121.

Process for Making Solid, Water-Soluble Tea Product. Frank C. Gephart and Rudolph H. Harries, New York, N. Y., said Harries assignor to said Gephart. — 1,520,122.

Water-Cooling Tower. Fred W. Haas, Pittsburgh, Pa.—1,520,125.

Oil-Vapor Generator. John R. Shannon, Lowell, Ariz.—1,520,146.

Apparatus for Separating Composite Oils Into Component Parts. Frank E. Van Tilburg, Minneapolis, Minn.—1,520,161.

Spray for Tomato Rust. Henry G. Meeks, Palmetto, Fla., assignor of one-half to Frederick Stevenson, Palmetto, Fla. — 1,520,197.

Crusher. David J. Nevill, Denver, Colo., assignor to the Stearns-Roger Mfg. Co. — 1,520,202.

Glass Feeder. Leonard D. Soubier and Enoch T. Ferngren, Toledo, O., assignors to the Owens Bottle Co., Toledo, O.—1,520,213.

Machine for Molding Phonograph Records. Charles A. Thomson, Belleville, N. J. —1,520,214.

Pulverizing Machine. Ernest H. Elzemeyer and Paul S. Knittel, St. Louis, Mo.— 1,520,228.

Means for Feeding Molten Glass. Enoch T. Ferngren, Toledo, O., assignor to the Owens Bottle Co., Toledo, O.—1,520,229.

Reduction of Metals. Walter Birkett Hamilton, Lancaster, England, and Fergus Reidl, Norfolk, Va.—1,520,240.

Lead Alloy and Process for Making Same. Walther Mathesius and Hans Mathesius, Charlottenburg, near Berlin, Germany. — 1,520,254.

Method of Preparing Adsorbent and Catalytic Oxides. Walter A. Patrick, Baltimore, Md., assignor to the Silica Gel Corp., Baltimore, Md.—1,520,305.

Crushing Mill. Emil Barthelmess, Düsseldorf-Oberkassel, Germany.—1,520,319.

Process for Quick Drying of Clay Articles. Robert N. Chapman, Dublin, Ga. —1,520,328.

Evaporating Apparatus. Horace F. Ruggles, New York, N. Y.—1,520,368.

Screen for Paper Pulp or the Like. John Magnus Larsson Spangenberg, Forshaga, Sweden.—1,520,371.

Machine for Grinding and Sifting Wood Pulp. Andreas Biffar, Miltenberg, Germany.—1,520,398.

Apparatus for Purifying Boiler Feed Water. Ferdinand Blumenthal, Cologne-Braunsfeld, Germany.—1,520,399.

Muffle Glass Furnace. Phillip Ebeling, Bellaire, O.—1,520,408.

Process of Catalyzing Gaseous Reactions. Marvin Pipkin, Fort Meade, Fla.—1,520,437.

Static-Electricity-Grounding Device. Frank C. Singleton, Chicago, Ill., assignor to Standard Oil Co., Whiting, Ind. — 1,520,485.

Refractory Article. Frank J. Tone, Niagara Falls, N. Y., assignor to the Carborundum Co., Niagara Falls, N. Y. — 1,520,487.

Revivifying Fullers Earth. Robert E. Wilson, Chicago, Ill., assignor to Standard Oil Co., Whiting, Ind.—1,520,493.

Chlorination of Hydrocarbon Gases. Elmer H. Payne and Samuel A. Montgomery, Wood River, Ill., assignors to Standard Oil Co., Whiting, Ind.—1,520,506.

Drier. William H. Rihl, Philadelphia, Pa., assignor to Proctor & Schwartz, Inc., Philadelpha, Pa.—1,520,512.

Method and Apparatus for Pulverizing. Louis De Markus, Montrose, Pa.—1,520,537.

Storage Battery. James F. McCauley, Cleveland, O.—1,520,587.

Washing Apparatus Suitable for the Treatment of Paper Pulp and for Other Purposes. William Arthur Ranken Michael McRae, London, England.—1,520,588.

Process of Recovering Natural Gas Gasoline From Natural Gas. Malcolm P. Youker, Bartlesville, Okla., assignor to Phillips Petroleum Co., Bartlesville, Okla. — 1,520,627.

Paper-Making Machine. Frank S. McDonnell, Mattapan, Mass., assignor to Rice, Barton & Fales, Inc., Worcester, Mass. — 1,520,659.

Apparatus for Manufacturing Thin Sheets of Gelatin. Robert A. McQuitty, London, England, assignor to George Nelson Dale & Co,. Ltd., Warwick, England. — 1,520,660.

Purified Anti-Diabetic Products and Process of Making It. George B. Walden, Franklin, Ind., assignor, by mesne assignments, to the Governors of the University of Toronto, Toronto, Ont., Canada. — 1,520,673.

New Publications

Government Master Specifications, Federal Specification Board

"Asphalt Prepared Roofing." Specification 192.

"Sole Leather." Specif. 241.

"Welded Wrought-Iron Pipe, Black and Galvanized." Specif. 242.

"Vitrified China." Specif. 243.

"Milled Toilet Soap." Specif. 244.

"Powdered Soap for Laundry Use." Specif. 245.

"Liquid Soap for Laundry Use." Specif. 246.

U. S. Geological Survey

"Manganese and Manganiferous Ores in 1923," by *Helena M. Meyer.*

"Lead in 1923," by *C. E. Siebenthal* and *A. Stoll.*

"Arsenic in 1923," by *V. C. Heikes* and *G. F. Loughlin.*

"Rare Metals," by *Frank L. Hess.*

"Secondary Metals in 1923," by *J. P. Dunlop.*

"Mineral Waters in 1923," by *W. D. Collins.*

"Asphalt and Related Bitumens in 1923," by *K. W. Cottrell.*

"Sand and Gravel in 1923," by *A. T. Coons.*

"Talc and Soapstone in 1923," by *B. H. Stoddard.*

"Silica in 1923, by *Frank J. Katz.*

Important Articles in Current Foreign Literature

"Filtration and Decantation in Chemical Industry." By *Livio Cambi.* The literature on theory and practice of separation of solids from liquids is briefly reviewed. Photographs and diagrams of Oliver, Wolf and Filtration Inc. Eng. Co. filters, and of the Dorr decanter, are given. The operations of filtering, decanting and washing precipitates are discussed. *Giorn. chim. ind. app.*, October, 1924, p. 485-95.

"Active Charcoals." By *Werner Mecklenburg.* It is shown that considerable deviations in performance of different samples of the same kind of charcoal (for example, for decolorizing, medicinal use, absorption, catalysis or for gas masks) must be expected. This is due to the numerous factors involved —namely, surface area per unit weight, capillary space per unit weight, area of capillary openings, particle size, chemical nature of the charcoal and of the substance with which it is used, and presence of foreign matter. Makers and users of the various active charcoals should give due consideration to this inevitable lack of uniformity. *Z. für angew. Chem.*, Nov. 6, 1924, pp. 873-7.

"Pumps in the Chemical Industry." By *Fritz Jaeger.* Uses of centrifugal, compressed air and other types of pumps in chemical plants; pumping corrosive liquids; relative efficiency of various types of pump. *Z. für angew. Chem.*, Nov. 6, 1924, pp. 882-5.

"New Equipment for the Fertilizer Industry." Describes and illustrates magnetic separators (one of which is automatic), a bone crusher, a hammer mill, a hammer mill with automatic feed, and a ring mill. *Chem.-Ztg.*, Nov. 13, 1924, pp. 836-7.

"The Corrosion of Metals." By *E. Maass* and *E. Liebreich.* Even though electrochemical processes are largely concerned in corrosion, the performance of a given metal in service depends only to a slight degree on its electrochemical nature. The chief governing factors are the external influences (mainly chemical) to which the metal is subjected in use. *Z. für angew. Chem.*, Nov. 13, 1924, pp. 897-9.

"A New Pump for Thick Liquids." An illustrated description of a new design of plunger pump suitable for pumping oils, clay, slimes, mash, tanning or dye liquors and other thick or lumpy liquids. *Chem.-Ztg.*, Nov. 20, 1924, p. 856.

"Storage Batteries With Non-Sulphatable Lead." By *Ch. Fery.* An arrangement of electrodes and electrolite in a lead accumulator which greatly decreases the rate of spontaneous discharge. Other advantages are high e.m.f., low internal resistance and low charging cost. Illustrated. *Compt. rend. de l'Academie des Sciences*, Nov. 24, 1924, pp. 1153-6.

News of the Industry

Summary of the Week

Prof. J. F. Norris of M.I.T. elected president of American Chemical Society.

Senator Norris would have investigation of "power trust" in relation to Muscle Shoals.

Import duty on oxalic acid is given maximum increase permitted by flexible tariff provisions.

Conference of trade associations called in Washington to consider adoption of standard inquiry, purchase order and invoice forms.

New Jersey Clay Workers, at annual meeting in New Brunswick, sever affiliation with American Ceramic Society.

Prof. James F. Norris Elected President of A.C.S.

Election of Prof. James F. Norris of the Massachusetts Institute of Technology as president of the American Chemical Society for 1925 has been announced. Professor Norris is chairman of the Division of Chemistry and Chemical Technology of the National Research Council. He succeeds Dr. Leo Hendrik Baekeland of New York.

Directors chosen are Prof. E. C. Franklin of Leland Stanford University and Dr. W. D. Bigelow, director of the Research Laboratories of the National Canners Association, Washington, D. C. Councillors-at-large named are Prof. T. B. Johnson, Yale University; Dr. A. M. Comey, Cambridge, Mass.; Prof. W. Lee Lewis, Northwestern University, and Edward Malinckrodt, Jr., manufacturer, of St. Louis, Mo.

Professor Norris was born in Baltimore, Md., Jan. 20, 1871. He received his A.B. at Johns Hopkins University in 1892 and his Ph.D. from the same institution in 1895. From 1895 to 1896 he was assistant in organic chemistry at the Massachusetts Institute of Technology. In 1896 he became an instructor, and in 1900 assistant professor. From 1904 to 1915 Dr. Norris was professor of chemistry at Simmons College and the following year he held a similar professorship at Vanderbilt University. In 1916 he became professor of general chemistry at M.I.T. and continued in that capacity until 1920, when he was made professor of organic chemistry, a chair which he now holds. During the war period he was an associate on the Naval Consulting Board; in charge of chemical research in war gas offense in the U. S. Bureau of Mines; Lieutenant-Colonel, Chemical Warfare Service; in charge of Chemical Warfare Service for England and inspection of German chemical war gas factories.

He is an assistant editor of the *Journal* of the American Chemical Society and was president of the New England Section of the society during 1904-1905. He was secretary of the Society of Arts, Boston, from 1902 until 1904 and president of the Chemistry Teachers Association of New England during 1906-1908. He is a fellow of the American Acadamy of Arts and Sciences and of the American Association for the Advancement of Science.

Chemical & Metallurgical Engineering is the successor to *Metallurgical & Chemical Engineering*, which, in turn, was a consolidation of *Electrochemical & Metallurgical Industry* and *Iron & Steel Magazine* effected in July, 1906.

The magazine was originally founded as *Electrochemical Industry*, in September, 1902, and was published monthly under the editorial direction of Dr. E. F. Roeber. It continued under that title until January, 1905, when it was changed to *Electrochemical & Metallurgical Industry*. In July, 1906, the consolidation was made with *Iron & Steel Magazine*, that had been founded 8 years previously by Dr. Albert Sauveur. In January, 1910, the title was changed to *Metallurgical & Chemical Engineering*, and semi-monthly publication was begun Sept. 1, 1915. On July 1, 1918, the title was changed to *Chemical & Metallurgical Engineering*, and weekly publication was begun Oct. 1, 1919.

Dr. E. F. Roeber was editor of the paper from the time it was founded until his death on Oct. 17, 1917. After a brief interim he was succeeded by H. C. Parmelee.

The staff of *Chemical & Metallurgical Engineering* comprises: H. C. Parmelee, editor; Charles Wadsworth, 3d, managing editor; A. W. Allen, Charles N. Hulburt, Sidney D. Kirkpatrick, R. S. McBride, Graham L. Montgomery and Alan G. Wikoff, assistant editors; Henry M. Batters and Hans H. Wanders, market editors; Harold J. Payne and Chaplin Tyler, editorial assistants.

Increase in Import Duty on Oxalic Acid

Acting upon a unanimous report of the Tariff Commission, President Coolidge on Dec. 29 issued a proclamation advancing the duty on oxalic acid from 4c. per lb., named in paragraph 1 of the 1922 tariff act, to 6c. per lb. The increase will become effective 30 days after the date of the proclamation and is the maximum permitted by the flexible tariff.

The differences in costs of production in the United States and in Germany, the principal competing country, are found to be greater than the present duty of 4c. per lb. and slightly greater than the maximum duty permissible under section 315, or 6c. per lb. These differences exist whether costs are compared at factory or with the addition of transportation costs.

After completion of the field investigation in this country and in Germany and Holland, a public hearing, as required by the statute, was held at the office of the Tariff Commission.

Prior to the war there was only one concern producing oxalic acid in the United States by the sawdust and caustic potash process, with a maximum output of 2,000,000 lb. a year. During the war the synthetic process, or sodium formate process, which had been previously developed in Germany, was established in the United States and commercial production is now carried on by this process both in the United States and in foreign countries.

German Company to Build Plants in United States

Advices received from Berlin last week stated that the Griesheim Chemical Works in Frankfurt, in conjunction with an unnamed American company, has concluded a program to build ammonia and nitrate works in the United States. According to the report, the plants are to be located in Chicago and Baltimore. Several directors of the Frankfurt company will leave for America soon.

New Jersey Clay Workers Sever Affiliation With Ceramic Society

Technical Program at Annual Meeting Includes Papers on Oil Firing, Tunnel Kilns, Feldspar, Tile, Casting Scrap and Zircon

THE APPROVAL of a resolution recommending that the New Jersey Clay Workers Association and Eastern Section of the American Ceramic Society resume its original name and status and that the charter granted by the parent organization for sectional affiliation be returned marked the business session of this organization's annual meeting in the Ceramics Building, Rutgers University, New Brunswick, N. J., Dec. 19. The society will accordingly be known in the future as the New Jersey Clay Workers Association, the name that was used from the formation of the society in 1914 until it reorganized as a local section of the American Ceramic Society in 1919.

Immediately following the adoption of this resolution it was voted to appoint a committee to draft a new application to the American Ceramic Society for a charter for an Eastern section, this to be formed and operated as a separate association under the name of the Eastern Section of the American Ceramic Society. It is expected that the new body will perfect its organization and begin to function at an early date.

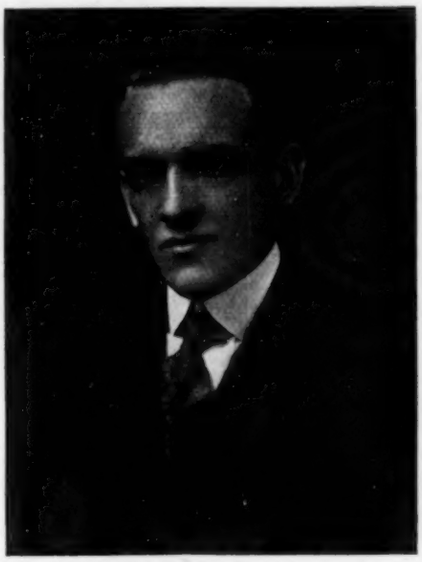
Concluding the morning program, officers were elected for the ensuing year. These, by unanimous vote are: President, Leslie Brown, Lenox, Inc., Trenton; vice-president, Fred A. Whitaker, General Ceramics Co., Keasbey, N. J.; councillor, Charles A. Bloomfield, Bloomfield Clay Co., Metuchen, N. J. (re-elected); and George H. Brown, secretary and treasurer (re-elected). For members of the executive committee, with terms expiring in December, 1927: Frank R. Valentine, M. D. Valentine & Bro. Co., Woodbridge, N. J.; George Simcoe, Edgar Brothers Co., Metuchen; Frederick Stanger, Enterprise White Clay Co., Philadelphia; D. W. Scammell, Scammell China Co., Trenton, and John M. Kreger, Woodbridge Ceramic Corporation, Woodbridge.

Part of the morning and all of the afternoon session was devoted to a varied technical program. Luncheon was served for the 150 members and guests at Winants Hall on the Rutgers campus, so that the program was delayed as little as possible. Abstracts of the papers are given below.

Tile for Vehicular Tunnel

Prof. George H. Brown reported an investigation of glazed wall tile for exterior service, conducted at the request of the engineers for the new vehicular tunnel connecting New York City with New Jersey.

Tile having absorptions varying from less than 1 per cent to 24 per cent were obtained from twenty-one representative American and foreign manufacturers. In an effort to reproduce service conditions these were subjected to the following tests: absorption; quenching; natural freezing; artificial freezing; mechanical strength; mortar adhesion. The results indicate that the vitreous tile, those having low absorption, will give more satisfactory service than porous tile.



Leslie Brown
New President of New Jersey Clay Workers Association

Utilization of Casting Scrap

Dr. E. A. Slagle, chemist, Trenton, and Andrew Foltz, president, Lambertville Pottery Co., Lambertville, N. J., showed that scrap could be used with perfect safety in making up casting slips by readjusting the hydrogen-ion concentration. In casting, water carrying salts in solution is absorbed from the slip by the molds so that the hydrogen-ion concentration of the casting scrap differs from that of the original slip. When scrap is returned to the blunger, the behavior of the slip is seriously affected unless the p_H is controlled.

The optimum p_H value for casting slip varies with different plants, because of variation in p_H of raw materials. At the Lambertville Pottery Co. the following p_H values were found. No. 1 black ball clay, 4.38; light ball clay, 5.02; china clay, 5.82; feldspar, 7.82; flint, 7.89. This pottery adjusts the p_H of its casting slip to 8.5 while Thomas Maddock's Sons Co. casts at 7.4 and the Resolute Pottery Co. works at 8.6.

Rapid Fire Tunnel Kiln

Taine G. McDougal discussed the novel tunnel kilns that have been developed at the A. C. Spark Plug Co., Flint, Mich., for spark plug porcelain and faience tile. Three kilns are in service: the two larger kilns are each 90 ft. long, and operate to cone 20, under a 15-hour firing period, for spark plug porcelain; for glazes, ranging from cones 1 to 10, the firing time is 6 hours. The third, or smaller kiln, is 60 ft. in length, and was installed in 1919; this is used for tile and other service, burning to cone 15 in an 18-hour period.

City gas has been used as fuel, but tests with fuel oil indicate that the cost of the latter will be about $27 for a 24-hour burning period on the larger kilns.

Points on Oil Firing

Factors affecting the application of oil burners in firing ceramic kilns were comprehensively discussed by L. A. Mekler, combustion engineer, Chicago, Ill. He pointed out that there are three types of burners available for use on ceramic kilns, these being high pressure, medium pressure and low pressure, respectively. The first operates under a pressure of about 25 lb.; the next, from 8 oz. to 2 lb., while the low-pressure burners operate under 8 oz. The use of medium-pressure burners was recommended for ceramic kilns.

To show the necessity for proper tests and investigations, the speaker cited the case of the New Jersey Terra Cotta Co., at its South Amboy, N. J., plant, where he has been conducting experiments for greater economy in operation. This plant formerly used on an average 6,300 gal. of oil for a 96-hour burning period at its kilns, or about 5 gal. per burner-hour; following adjustments and corrections, a gross of approximately 4,800 gal. of oil is now being consumed in the same burning time, or on a basis of 3.9 gal. per burner-hour.

Factory Tests for Feldspar

In using feldspar for sanitary ware, John M. Kreger, Woodbridge Ceramic Corporation, found that some lots gave trouble in production even though the customary fusing test had seemed satisfactory. Firing tests were made with eleven brands of commercial feldspar in various mixes and the results of these were found to be more reliable as indications of the actual value of the feldspar. In one test, feldspar and flint were mixed 90:10, respectively, 80:20 and so on down to 50:50 and molded into cones which were fired with the ware in a commercial kiln. Such tests are worth the extra trouble, as they are much more conclusive than the simple fusion test.

Zircon in Ceramic Bodies

W. L. Shearer, department of ceramics, Rutgers University, reported tests on the use of zircon in ceramic bodies. Its high fusion point, high specific gravity and marked resistance to thermal shock warrant more extended study of its possibilities.

Gas Products Association to Meet in Chicago

The Gas Products Association, the trade association of the oxy-acetylene industry, composed of producers of oxygen, hydrogen and acetylene gases, carbide, welding and cutting apparatus and supplies, will hold its eleventh mid-winter convention at the Hotel Sherman, Chicago, Jan. 22, 23 and 24. The convention will close with a banquet on Saturday evening, Jan. 25.

Washington News

Trade Associations to Confer on Simpler, Standard Forms

A conference of trade associations representing many fields has been called by the Division of Simplified Practice to be held Jan. 14 at the Department of Commerce to consider adoption of standard inquiry, purchase order and invoice forms. A survey by the National Association of Purchasing Agents, at whose request the conference has been called, indicates a potential saving of $15,000,000 annually to business concerns of the country through use of standard forms, through reduction in clerical forces if all forms were of standard size and arrangement, through lower printing bills and by other economies.

Industry and the railroads have been studying this problem for more than 3 years. Several associations other than the National Association of Purchasing Agents recently have indorsed the movement and thirty organizations are said to be actively interested.

Germany Increases Foreign Trade in Chemicals

Germany's exports of chemical and pharmaceutical products, colors and coloring materials in October amounted to 205,260 metric tons, or 18 per cent above average monthly exports during the 10 months, January to October, inclusive, 1924, according to advices to the Department of Commerce from Trade Commissioner William T. Daugherty, Berlin. Similarly, imports showed a considerable increase, to 101,305 tons, or 64 per cent above the monthly average for this period of 1924.

The largest export increase, quantitatively considered, was registered in October in Group A, the chemical bases, salts, acids and other heavy chemicals, to a total of 190,305 tons, or 19 per cent above the monthly average. Exports of artificial fertilizers, not including potash, were increased in October to 4,222 tons, or almost 65 per cent above the monthly average.

The most striking increase in imports in October was of the artificial fertilizers. This was particularly true in the case of Thomas meal, 83,627 tons of which were imported in October, chiefly from Alsace-Lorraine and Luxenburg steel mills. These imports are of course calculated to offset the phosphate fertilizer shortage here, consumption of P205 in the fertilizer year having declined to 167,000 tons, against 630,000 tons in 1913-14.

Following is a recapitulation; the figures are metric tons:

	Imports		Exports	
	October	Average 10 Mos. 1924	October	Average 10 Mos. 1924
Grand total	101,305	61,651	205,270	173,572
Chem. bases, salts, acids, and other compounds	11,309	14,360	190,305	159,425
Colors and coloring materials	858	757	7,479	8,034
Varnishes, lacquers, etc.	45	27	350	396
Ether, alcohols, oils, art. perfumes and cosmetics	1,130	1,014	707	667
Art. fertilizers ex. potash	84,690	41,850	4,222	2,560
Explosives, ammunition and matches	2.6	15	559	954
Chem. and pharm. prep's	5,270	3,608	1,645	1,545

Census of Dyes and Chemicals to Be Compiled

The United States Tariff Commission sent to domestic manufacturers on Jan. 2, schedules for compiling its annual "Census of Dyes and Other Synthetic Organic Chemicals" for 1924, as for previous years. This will make the eighth annual report compiled by the commission on the production of dyes and organic chemicals in the United States. This census covers synthetic organic chemicals of non-coal-tar origin, as well as chemicals derived in whole or in part from coal tar. Any firms that manufacture these products and that do not receive schedules for reporting their production and sales of synthetic organic chemicals during 1924 will be sent copies on request. The commission requests the domestic manufacturers of dyes and synthetic organic chemicals to co-operate by promptly returning these schedules completely filled out, so that the report covering 1924 may be issued early in 1925.

In accordance with the provisions of paragraph 28 of the tariff act of 1922, the ad valorem duty on dyes and finished coal-tar products was reduced on Sept. 22, 1924, from 60 to 45 per cent, and the duty on intermediate products was reduced from 55 to 40 per cent. The specific duty of 7 cents per pound on both groups of products remains unchanged. In order that data may be available to study the effect of this reduction in duty, the Tariff Commission has recently completed a compilation of the total sales of domestic dyes for the first 9 months of 1924 and 1923. These data, together with the sales for the whole year of 1924, which the commission is now gathering, and with the imports of dyes by months, will enable the commission to analyze further the effects of the reduction in the duty on dyes.

Sales of Dyes, 1923 and 1924

The total sales of coal-tar dyes of domestic manufacture for the first 9 months of 1923 were about 64,500,000 lb., valued at $36,500,000, while the total sales for the first 9 months of 1924 were about 47,200,000 lb., valued at $24,300,000. Sales by quantity for the first 9 months of 1924 represent a 27 per cent decline from those of 1923, while by value the reduction was 33 per cent. The average selling price for the first 9 months of 1924 was 51 cents per pound, or about a 9 per cent decline from the price during the corresponding period of 1923, which was 56 cents. These values may be compared with an average sales value of 54.5 cents for 12 months of 1923, 60 cents for 1922, 83 cents for 1921 and $1.26 for 1917.

The principal reason given by the dye manufacturers for changes in the volume of sales during 1924 as compared with those of 1923 was the reduction in the activity of the textile and other dye consuming industries.

Other reasons given by the manufacturers for the reduction in dye sales during 1924 were:

(a) Delayed purchases of dyes in anticipation of the reduction in import duties on Sept. 22, 1924.

(b) Keen competition among domestic producers. A number of the firms reported sales during 1924 at and below cost of production.

(c) Increased imports of certain dyes, which reduced the sales of those firms producing only these colors.

(d) Popularity of light shades during 1924, which reduced the consumption of dyes.

A reduction in total sales was not reported by all domestic companies. In the case of a few firms the value of sales increased due to the manufacture of new dyes of a higher value instead of the production of cheaper dyes.

Higher Duty on Nitrite of Soda Displeases Norwegians

Norway is objecting strenuously to the American duty on sodium nitrite, and particularly to the increase under the flexible provisions of the tariff law. The advance in the duty since 1922 from ½ cent to 4½ cents is held to be "intolerable."

An article recently published in Norway reflects the views of the Norwegian industry. Wonder is expressed that the United States can take pride in a duty "for a factory which is not in a position to cover the requirements of the country."

The action of certain Norwegian manufacturers in refusing to allow the agents of the Tariff Commission "to fish into their books" is commended as the only position that can be taken by the self-respecting.

In that connection it may be stated that the tariff law has a ready remedy for just that attitude. Such a position plays directly into the hands of the protected industry in that imports may be suspended until the cost information is forthcoming. The policy said to have been adopted in Norway is not characteristic of the general attitude of manufacturers in other European countries. While there was some opposition to the plan at first, in some cases where investigations have been made it has been found that European costs have been higher than had been supposed. The average foreign manufacturer realizes that claims as to low cost of manufacture frequently are exaggerated, particularly when protection is being sought, and in some instances they are glad to have an opportunity to establish the real facts. The Tariff Commission's foreign investigators have encountered surprisingly little trouble in securing manufacturing costs.

News in Brief

Bureau of Mines Electric Furnace Equipment Destroyed—All of the electric furnace equipment of the Bureau of Mines was completely destroyed by the recent fire which burned the old Mines building at the University of Washington. The bureau's equipment was housed in the building. It is expected that Congress will provide at this session for the replacement of the transformers, the switchboard and the other electric equipment which is so essential to the work assigned to the Seattle Experiment Station.

Ford Co. Establishes Engineering Laboratory—What is said to be the finest engineering laboratory in the country is being completed by the Ford Motor Co., at Dearborn, Mich., in the center of the Detroit area where the different Ford plants are located. It is designed for chemical, metallurgical and affiliated industrial research and experiments, comprising practically one room in a new building, 202x804 ft., approximately two city blocks in length. The total glass area of the new laboratory proper aggregates 64,000 sq.ft., or equivalent to 40 per cent of the total floor space. The mechanical installation consists of complete equipment for the construction of an entire automobile, with chemical research apparatus, physical test machines, equipment for metallurgical research and investigations, drafting room facilities, etc. No piping or wiring is exposed in the laboratory; all power lines are under the floor in conduits, with feed wires .ed up through the floor to individual motor drives. The building will also contain a comprehensive reference library.

Half Million Fuel Oil Supply Plant for Lake Vessels—The Imperial Oil Co. is constructing an oil storage and supply plant in the harbor industrial area of Toronto. It is the intention of the company to spend $500,000 in equipment for the supply of fuel oil to lake vessels, many of which are now making this port on the trip from the upper lakes to Montreal.

Bakelite Planning Large Research Laboratory—Probably the largest research organization ever developed for the study of synthetic resins will be housed in the new laboratory of the Bakelite Corporation now nearing completion at Bloomfield, N. J. The building is of brick, steel and concrete construction, two stories high and approximately 50 ft. by 110 ft. in size. Present plans are for accommodations to take care of twenty-five research workers, each worker to be assisted by one or two helpers. Major problems of raw material production, improvement and modification of synthetic resin compounds and of general commercial development will be handled. It is aimed to make the work very broad in scope.

Christmas Bonuses for Millboard Employees—The Agasote Millboard Co., Trenton, N. J., distributed a Christmas bonus at its plant totaling approximately $10,000.

Engineering Standards Committee Elects Officers for 1925

At the annual meeting of the American Engineering Standards Committee, Charles E. Skinner, a representative of the American Institute of Electrical Engineers, was elected chairman for the year 1925, and Charles Rufus Harte, representative of the American Electric Railway Association, was elected vice-chairman.

The other members of the executive committee for 1925 are as follows: Ralph G. Barrows, U. S. War Department; George K. Burgess, U. S. Department of Commerce; John A. Capp, American Society for Testing Materials; Coker F. Clarkson, Society of Automotive Engineers; W. A. E. Doying, Panama Canal; Stanley G. Flagg, Jr., American Society of Mechanical Engineers; E. A. Frink, American Railway Association, engineering division; C. S. Gillette, U. S. Navy Department; O. P. Hood, U. S. Department of the Interior; Sullivan W. Jones, American Institute of Architects; Thomas A. MacDonald, U. S. Department of Agriculture; Charles A. Mead, American Society of Civil Engineers; A. H. Moore, Electrical Manufacturers Council; A. Cressy Morrison, Gas Group; Dana Pierce, Fire Protection Group; F. L. Rhodes, Telephone Group; S. G. Rhodes, Electric Light and Power Group; C. F. W. Rys, Association of American Steel Manufacturers; Ethelebert Stewart, U. S. Department of Labor; George C. Stone, American Institute of Mining Engineers; Albert W. Whitney, Safety Group.

Symposium on Flames at the Baltimore Meeting A.C.S.

The Gas and Fuel Section of the American Chemical Society at the Baltimore meeting in April has made plans for a symposium dealing with flames, their chemistry and controlling factors.

Alkali Export Association Sued Under Anti-Trust Law

Suit has been filed in the United States District Court by Percival E. Falkingham against the United States Alkali Export Association and the several companies that are a part of the association. Damages of $1,125,000 are asked under the Sherman anti-trust law. The complaint contains eight counts, which include charges of unlawful combination and conspiracy in restraint of trade in caustic soda and soda ash. It is also charged that the association restrained trade of competitors, controlling prices, refusing to sell to competitors, fining their members who did not sell according to regulations, and other trade abuses whereby the business of the plaintiff suffered. In addition to the export association, the following are named as defendants: The Solvay Process Co., Diamond Alkali Co., Michigan Alkali Co., Mathieson Alkali Works, Hooker Electrochemical Co., Pittsburgh Plate Glass Co., Pennsylvania Salt Manufacturing Co., Warner Chemical Co., Westvaco Chlorine Products, Inc.; Isaac Winkler & Bro., Eli Winkler, Horace G. Carrell, Harry M. Hooker, Ernest V. Finch, Irving H. Taylor, Frederick G. Lancaster, Charles M. Butterworth, A. Kienele and John A. Chew.

Senator Norris Would Have Senate Ferret Out "Power Trust"

A resolution proposing that the Federal Trade Commission investigate and report to the Senate the extent to which a power trust exists in the United States was introduced on Dec. 29 by Senator Norris of Nebraska. On the objection of Senator Edge of New Jersey immediate consideration of the resolution was blocked and, as this is written, no action on it has been taken by the Senate.

When Senator Harrison of Mississippi referred to Gustavus Ober, Jr., of Baltimore, president of the National Fertilizer Association, as the head of the fertilizer trust and criticised his attitude toward the Ford bill, the Underwood bill and the other measures containing provisions for the manufacture of fertilizers by the government, Senator Bruce of Maryland retaliated by referring to the Mississippi Senator as a "narrow, contracted and small-bore partisan."

"It is impossible for me to hear," said Senator Bruce, "such a slighting, not to say contemptuous, reference made to one of the most conspicuous and honorable of our citizens in Baltimore as has been made by the Senator from Mississippi (Mr. Harrison) without repelling, and quickly repelling, the inferences that he desires to be drawn from what he said."

Japan Will Levy ad Valorem Duties on Soaps and Oils

According to a cablegram received by the Department of State on Dec. 22 from the American Ambassador at Tokyo, officials of the Japanese Foreign Office state informally that, effective Dec. 31, 1924, the proportional ad valorem duties stipulated in the conventional tariff with France will be applied to articles of French origin coming within the scope of the luxury tariff. The following ad valorem duties will, therefore, be levied on luxury articles imported into Japan from France and from all countries, including the United States, entitled to the benefits of the Japanese conventional tariff: perfumed soaps, 62.9 per cent; other soaps, 50.9 per cent (tariff No. 117); perfumed oils. fats and waxes and preparations thereof, 44.9 per cent (tariff No. 118); perfumed vinegar, 33.3 per cent, other perfumed waters, 55.6 per cent (tariff No. 119); tooth powders, tooth washes, toilet powders and other prepared perfumeries not otherwise provided for, 50 per cent (tariff No. 222); binoculars and monoculars with precious metals, metals coated with precious metals, precious stones, semi-precious stones, pearls, corals, elephant's ivory, tortoise shells or shells, with prisms 66.7 per cent, others 83.3 per cent (tariff No. 533).

Men You Should Know About

Major RAY BALDWIN, head of the Elk Silk Mills, Elkton, Md., delivered an address on the subject of fiber silk before members of the wholesale section of the Chamber of Commerce, Wilmington, Del., at the Hotel du Pont in that city, Dec. 22.

CHARLES W. BROWN, president of the Philadelphia Plate Glass Co., has been elected a director of the Bell Telephone Co. of Pennsylvania.

A. K. CAMERON, vice-president and general manager of the Metal Shingle & Siding Co. of Preston, Ont., has been appointed director of the St. Lawrence Paper Co.

Dr. W. I. CLARK of the Norton Co., Worcester, Mass., manufacturer of abrasive materials, gave an interesting lecture before the members of the Massachusetts Safety Council, Boston, Dec. 23, on the subject "Glass Eyes or Glass Windows."

CHARLES S. GARLAND, manager of the coke department of Hickman, Williams & Co., Pittsburgh, Pa., has been appointed district manager for the company at New York, with headquarters in the Equitable Building. He was graduated from Yale University, class of 1920.

W. J. GELDARD has resigned from the National Bureau of Standards to accept a position as director of the division of control and testing of the Fisk Rubber Co. He is located at the Chicopee Falls, Mass., plant of the company.

U. T. HUNGERFORD, founder and chairman of the board of directors of the U. T. Hungerford Brass & Copper Co., New York, celebrated his eighty-third birthday on Dec. 18.

E. M. LONG of Pittsburgh, Pa., heretofore connected with the McLain Fire Brick Co., Pittsburgh, has accepted a position as general manager for the Beaver Clay Manufacturing Co., New Galilee, Pa., succeeding H. R. Beegle, resigned.

FRED MASON, vice-president of the American Sugar Refining Co., New York, has been elected a permanent director of the American Specialty Manufacturers Association.

WILLIAM MCMASTER, who has been the president of Canadian Explosives for the past 15 years, retired from office at the end of 1924. Mr. McMaster has had an extremely busy as well as successful career and has been identified with many of Canada's leading industries.

Prof. JAMES F. NORRIS, who holds the chair of organic chemistry at the Massachusetts Institute of Technology, was recently elected president of the American Chemical Society, succeeding Dr. L. H. Baekeland.

O. C. ROACH, of the United States Rubber Co., New York, has been elected secretary of the American Manufacturers Association, 2 Rector St., New York, succeeding Harry W. Hanson, resigned.

C. B. STARR, formerly assistant mechanical engineer with the Duff Manufacturing Co. of Pittsburgh, Pa., and later sales engineer with the Detroit office of the Wayne Tank & Pump Co., is now with the Robert June Engineering Management Organization at 8835 Linwood Ave., Detroit, Mich.

DAVID J. SULLIVAN, formerly connected with the British-American Rubber Co., Stamford, Conn., is now chemical engineer with the Fisk Tire Co., Chicopee Falls, Mass.

CHARLES E. VOITLE, assistant secretary of the National Association of Manufacturers of Pressed and Blown Glassware, Pittsburgh, Pa., is absent on a trip to the Pacific coast.

E. J. WATZL, formerly consulting chemical engineer for Skoda Works, in Vienna, Austria, arrived in New York on the S.S. "Columbus," Dec. 23. Mr. Watzl expects to interest American chemical manufacturers in a number of processes and products recently developed in Austria and Germany.

L. WHINYATES, an experienced manufacturing chemist, with knowledge of English and American practice, has been appointed assistant manager of the Dye & Chemical Co. of Kingston, Ont., Canada.

FRED A. WHITAKER, superintendent, General Ceramics Co., Keasbey, N. J., has been elected vice-president of the New Jersey Clay Workers Association.

Calendar

AMERICAN CERAMIC SOCIETY, annual meeting, Columbus, Ohio, Feb. 16 to 21.

AMERICAN CHEMICAL SOCIETY, New York Section, Jan. 9.

AMERICAN ELECTROCHEMICAL SOCIETY, Niagara Falls, April 23 to 25.

AMERICAN PULP AND PAPER MILL SUPERINTENDENTS ASSOCIATION, Niagara Falls, N. Y., June 4 to 6.

AMERICAN MANAGEMENT ASSOCIATION, annual convention, Hotel Astor, New York, Jan. 28, 29 and 30.

AMERICAN SOCIETY FOR TESTING MATERIALS, twenty-eighth annual meeting, Atlantic City, N. J., June 22 to 26.

BRUSSELS INTERNATIONAL AND COMMERCIAL FAIR (sixth), Brussels, Belgium, March 25 to April 8.

CANADIAN NATIONAL CLAY PRODUCTS ASSOCIATION, twenty-third annual convention, Prince George Hotel, Toronto, Canada, Jan. 20 to 22.

CANADIAN PULP AND PAPER ASSOCIATION, Montreal, Jan. 28 to 30.

COMPRESSED GAS MANUFACTURERS ASSOCIATION, twelfth annual meeting, Hotel Astor, New York, Jan. 26.

GAS PRODUCTS ASSOCIATION, Hotel Sherman, Chicago, Ill., Jan. 22 to 24.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES, New York, Sept. 28 to Oct. 3.

SOCIETY OF CHEMICAL INDUSTRY, Chemists Club, New York, Jan. 16.

SOUTHERN EXPOSITION, Grand Central Palace, New York, May 11 to 23.

TECHNICAL ASSOCIATION OF THE PULP & PAPER INDUSTRY, Waldorf-Astoria, New York, Feb. 3 to 5.

Obituary

WILLIAM P. BLAIR of Cleveland, Ohio, for many years secretary of the National Paving Brick Manufacturers Association, died on Dec. 23, after an illness of more than a year. He was born at Plainfield, Ind., in 1854, and for a number of years resided at Indianapolis, removing from there to Cleveland in 1910. Mr. Blair became secretary of the paving brick manufacturers' organization in 1905, and continued in that office until 1920, when he was elected vice-president of the association. He was president of the National Brick Manufacturers Association in 1910, and served on the executive committee of that organization until his death. Mr. Blair was instrumental in the development of the standard rattler test for paving brick, now in general use for determining the quality of such material.

Dr. ROGER FREDERIC BRUNEL, head of the department of chemistry of Bryn Mawr College, died recently following an operation.

C. T. COLLINS, chairman of the board of directors of the Standard Oil Co. of Kentucky, died at his residence at Louisville on Dec. 26, aged 76 years, following an illness of more than a month.

ERIK ENEQUIST of Brooklyn, N. Y., glass chemist, died recently at his local residence.

FREDERICK A. FITZGERALD, founder and first president of the Imperial Oil, Ltd., died at his home in London, Ont., recently. He was in his eighty-sixth year.

THOMAS S. KIERNAN, vice-president in charge of tanning operations of the Griess-Pfleger Tanning Co., Cincinnati, Ohio, died suddenly at Boston, Mass., on Dec. 16, of heart trouble. He began his career with the Lambeau Leather Co., Chicago, Ill., and later became connected with the American Hide & Leather Co. Mr. Kiernan was one of the founders of the Griess-Pfleger Tanning Co. in 1907, and had been associated continuously with the company since that time. He was responsible in a large measure for the development of side leather and strived for the present excellence of this product. Mr. Kiernan is survived by his wife, two sons and four daughters.

Dr. GEORGE D. LIVEING, president of St. John's College, Cambridge, England, and known as the father of chemistry at that institution, died on Dec. 26, as the result of an accident. He was 97 years of age and for 47 years was professor of chemistry at the college, where he started the first students' laboratory in 1852. Dr. Liveing was the recipent of the Davy medal from the Royal Society in 1901.

Prices for Chemicals Tend Toward Higher Levels

Weighted Index Number Showed Material Gain in December—Trading Slower at End of Month

Placing of contract orders was a feature of the market for chemicals for the greater part of last month. At the close of the period it was stated that producers of heavy chemicals were carrying orders for 1925 delivery considerably in excess of the business placed at the corresponding period of 1923 for 1924 delivery. In other words, the contracting movement in the latter part of 1924 was larger than in 1923. This is an index of larger consumption in the current year, provided jobbing demand is at least up to normal. There was a fairly steady call for prompt shipments throughout the greater part of December, but there was a slowing up in activity in the latter part of the month owing to the approach of the inventory-taking period.

The weighted index number for December continued along progressive lines and shows an average of 158.11 for the period. This compares with 155.18 for November and 154.30 for October. The higher price level was again due in large part to advances in some of the important allied products, but a contributing factor was found in stronger markets for various chemicals, and the weighted number may be taken as a true criterion of the trend of values. The various salts that depend upon metal bases were directly influenced by higher selling prices in the metal markets. The lead and tin products were especially prominent in the advances recorded. Reports from foreign markets indicated that values for chemicals abroad were well sustained and in some cases were advancing. Hence there was little disposition to lower values for imported chemicals in the spot market and shipments were on a higher average basis.

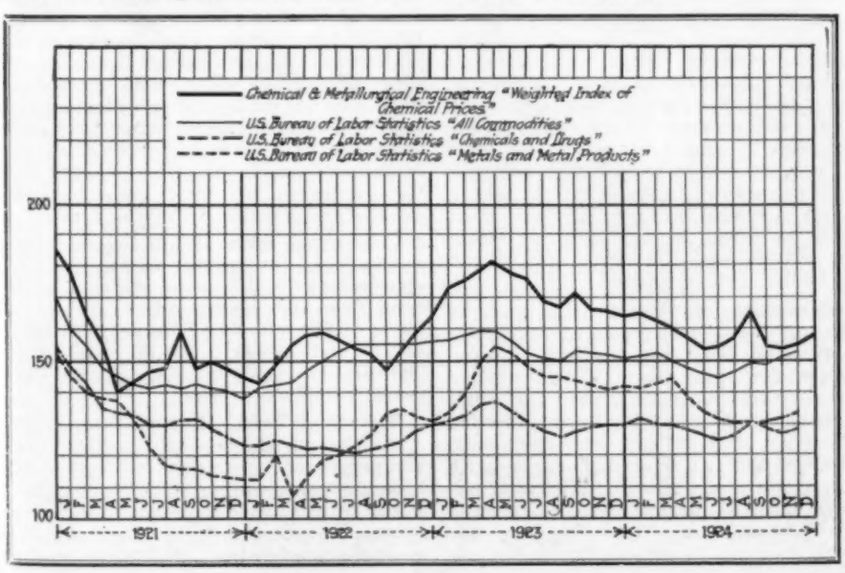
The Bureau of Labor in reporting on wholesale prices for November stated that the all-commodity list averaged higher than in October. This was based on investigations into 404 commodities or price series, and the weighted number for November was 152.7 as compared with 151.9 for October and 152.1 for November, 1923. Metals and metal products showed a higher proportionate gain, the numbers for November and October being 128.7 and 127.2 respectively. Chemicals and drugs advanced from 132.2 in October to 134 in November.

On Dec. 29 the President signed a proclamation authorizing an increase of 50 per cent in the import duty on oxalic acid. The Tariff Commission had rendered a unanimous report recommending this increase, based on the result of investigations into production costs here and abroad. It was also announced that the commission would soon proceed to issue a report on investigations into vegetable oils and definite action on the tariff status of the latter may be taken in the current month.

Chilean Producers Extol Merits of Nitrate of Soda

The Association of Chilean Producers of Chile, in addition to launching a pretentious research program and drive against the export tax, is setting out, it is understood, to convince the farmers of the world that Chilean nitrate is superior for fertilizer purposes to the synthetic product. Chilean nitrate contains iodine. Synthetic products do not. This will be one of the points on which claims of superiority will be based. Incidentally, this propaganda is expected to make some headway. There still is in the popular mind a belief that natural products are better than synthetic ones.

In connection with the claims being put forward as to the value of iodine as a plant food it may be stated that metallurgists and dye makers in the United States would think much more highly of the Chilean producers were they to recover more iodine and allow it to find its way into trade channels. While it may be that the profit for handling the larger volume would be no greater than that obtained from the artificial price level now maintained, the Chilean producers at least would be absolved of the charge of wasting a valuable raw material.



Trade Notes

Plans are under consideration for the rebuilding of the plant of the Paper Makers Chemical Co. at Easton, Pa., which was destroyed by fire on Dec. 20. The loss to plant and equipment was placed at $100,000.

Martin F. Austin, who for several years was in charge of the oil department of J. C. Francesconi & Co., is now associated with W. R. Grace & Co.

The Oil Trades Association of New York held a New Year's luncheon at the Whitehall Club last Tuesday. J. McD. Murray, president of the association, announced that the annual banquet would be held on Feb. 10 at the Waldorf-Astoria.

S. M. Archer has been elected president of the Archer-Daniels-Midland Co. of Minneapolis. J. W. Daniels, the retiring president, was elected chairman of the board of directors.

A vast reserve of high-grade limestone suitable for metallurgical purposes has been acquired by the Ford Motor Co. in the purchase of about 2,000 acres on Thunder Bay near Alpena, Mich.

A report from Berlin states that the German nitrate syndicate sold 1,082,000 double cwt. of potassium oxide in November. It had 282,000 double cwt. booked early in December.

Financial

The board of directors of Atlas Powder Co. at meeting held Dec. 23, declared regular dividend of 1¾ per cent on the preferred stock, payable Feb. 2.

The Canadian Industrial Alcohol Co. has declared a dividend of 32c., payable Jan. 15. This is on basis of $2.56 on old stock, or at the rate of 10.24 per cent per annum, compared with 8 per cent paid before stock was split.

The Corn Products Refining Co. declared regular quarterly dividends of 50c. on common and $1.75 on preferred stocks. Common dividend is payable Jan. 20 and preferred Jan. 15.

A report from Boston states that S. Slater & Sons, Inc., has retired and canceled 19,000 shares of the capital stock of 20,000 shares held in the treasury, which reduces the authorized capital from $3,000,000 to $1,100,000.

The United States Smelting, Refining & Mining Co. for 11 months ended Nov. 30 reports consolidated earnings after interest of $4,958,747. From these earnings there have been deducted reserves of $1,944,424 for depreciation, depletion and amortization, leaving estimated net profit of $3,014,323, against $2,178,000 in same period of 1923.

Market Conditions

Increase in Duty Gives Firmer Tone to Market for Oxalic Acid

Import Tariff Raised to 6c. Per Lb.—Spot Trading in Chemicals Quiet During Week

TRADING in chemicals was reported to be seasonal during the past week. Directions for contract deliveries have been coming to hand in good numbers but call for spot goods was light. Consumers have been content to work on small stocks so as to reduce inventories. Some plants have been closed and this has tended to cut down consumption temporarily.

In contrast to the general market there was unusual activity in oxalic acid following the announcement that the import duty had been raised to 6c. per lb. The general opinion was that the higher duty would force an upward revision in prices for the imported grades and that with the lessened competition, domestic makers would welcome the opportunity to sell at higher prices. Naturally buyers were interested to cover before advances in price went into effect and inquiries were frequent both for prompt and later deliveries. The market was unsettled with sellers taking some business at the old levels but reserved about quoting on futures. Some interest also was reported for citric acid for nearby and later deliveries.

The weighted index number for the week was 160.25 as compared with 160.09 for the preceding week, and 164.43 for the corresponding week a year ago. Tin salts, prussiates, and linseed oil were among the items which had a strengthening effect on the index number. It is pointed out that foreign markets have shown a firmer tendency and with recoveries in the latter, domestic markets will be in a better position to advance in price.

The metal markets have held a strong position and selling prices for lead and antimony were above the levels of the preceding week. The steady rise in metals has been one of the outstanding features of recent trading and the position of metal derivatives has changed accordingly with a probability that the highest prices have not yet been reached.

Acids

Interest in the market for acids centered in oxalic due to the announcement that the import duty had been increased from 4c. per lb. to 6c. per lb. The proclamation to that effect was signed by the President on Dec. 29 and will become effective 30 days after that date. With competition from foreign producers thus reduced, the market took on a firmer tone and higher price levels are expected. Tartaric acid continued to show strength and while buying was not active, the inside quotation was steady at 27c. per lb. Acetic acid has not varied in position with a good movement reported especially for the lower strengths. Some inquiry has been noted for citric acid for deferred delivery with values well maintained in primary markets. Boric acid has sold in a seasonal way with sellers offering freely and values held at relatively low levels as a result of the keen competition. Lactic acid presents one of the real strong spots in the market with a steady call from consuming industries. No improvement has taken place in the case of formic acid and recent sales have been made on a basis of 10½c. per lb. The better position of sulphuric acid is evidenced by the fact that some producers are asking higher prices for acid made from sulphur and also by the report that certain producers are sold ahead and are taking outside production to fill excess orders.

Acetone Reduced in Price—Tin Oxide Higher — Activity in Oxalic Acid — Prussiates More Firmly Held — Inactive Market for Arsenic — Steady Tone to Alkalis — Calcined Carbonate of Potash Still Scarce — Nitrite of Soda Easier — Good Demand for Sulphate of Ammonia

Potashes

Bichromate of Potash — Consuming demand has continued along quiet lines. Prospects are regarded as favoring a larger consumption in the coming year but some producers have curtailed their output because they are not satisfied with prevailing prices. General asking prices are 8¼@8½c. per lb., but recent sales at lower figures have unsettled the market and the quoted prices can probably still be shaded.

Carbonate of Potash — Supplies of calcined carbonate remain at low levels and round lots are difficult to locate. Prices for spot goods, therefore, are little better than nominal but shipments are offered at 6c. per lb. Limited offerings of 96-98 per cent are available on spot at 6¼@6½c. per lb. with shipments at 6c. per lb. Hydrated has been a little firmer with 5¼c. per lb. given as an inside figure for 80-85 per cent.

Caustic Potash—Cable advices have shown that shipment prices from foreign markets are firm at 7½c. per lb. with no reason to look for any lowering of that figure. Spot holdings are influenced by replacement costs and goods ex-store are held at 7¼@7½c. per lb. Domestic caustic has been finding a good outlet with prices at works ranging from 7¼c. per lb. upward according to quantity.

Nitrate of Potash — Domestic producers are finding competition from the foreign product and arrivals from foreign markets are noted with regularity. Prices for the latter show a range according to seller with some concessions as compared with values for domestic nitrate. The latter is quoted at 6@6¼c. per lb. for granulated and 7@7¼c. per lb. for powdered.

Prussiate of Potash—Red prussiate has attracted very little interest and only small lots have changed hands. The asking price is 37@38c. per lb. Yellow prussiate has been firmer in all positions with reports that foreign sellers are reserved and are holding out for 18c. per lb. for shipments. The latter figure also is asked for spot goods.

Sodas

Bichromate of Soda — The contracting movement has been good and producers are said to have entered the new year with a larger volume of orders in hand than was the case a year ago. Spot trading during the week was quiet and export demand was light. The market shows no change for the period and open quotations are held at 6¼@6½c. per lb., with business hardly active enough to test the stability of these figures.

Caustic Soda—The so-called outside offerings for export appear to be of small volume and quotations f.a.s. are on a fairly steady basis with $2.90 per 100 lb. the lowest price heard. This in contrast to the market for a short time ago when sales were made at $2.75 per 100 lb. Domestic consumption has been heavy and promises to be so for some time to come. Prices are at established levels of $3.10 per 100 lb. for contracts of solid caustic with ground and flake at $3.50 per 100 lb.

Chlorate of Soda—While buyers have not been in the market to any extent, spot values for imported chlorate have been firm and asking prices are on a basis of 6¼c. per lb. Forward positions are offered at 6c. per lb. Domestic chlorate is steady at 6½c. per lb. for round lots, f.o.b. works.

Nitrate of Soda—Reports from Chile state that producers will undertake a campaign of education in order to broaden consumption of nitrate. Reports from Europe say that stocks are large and prices are too high to encourage consumption. Shipments to the

United States in November were small, amounting to less than 46,000 tons, but stocks are plentiful and recent demand for spot goods has been slow and has forced sellers to grant some concessions. January shipment is quoted at $2.49@$2.50 per 100 lb.

Nitrite of Soda—Offerings of domestic nitrite have been more free and production is said to be proceeding along liberal lines. Producers are holding numerous contracts but have a surplus for new accounts and are quoting 9@9¼c. per lb. Imported nitrite on spot has been held at 9¼@9½c. per lb.

Prussiate of Soda — Importers have been governed by reports of higher markets abroad and have been asking more for spot holdings. There has been some difference in price according to seller but 9½c. per lb. is generally asked for spot goods and shipments are on a parity with the spot figure with some reports stating that foreign factors are not eager to push sales at that level.

Miscellaneous Chemicals

Acetone—This material has been subject to price cutting in recent weeks and this has resulted in an open break in prices with carlots now offered at 12c. per lb. at works. On smaller lots a graded scale on prices is effective.

Arsenic—Producers of domestic arsenic report a stagnant market and say that further declines in price would have no effect on buying. They are quoting 6½c. per lb. delivered for round lots but this price does not mean much in view of the lack of buying. Imported grades also are dull with 6c. per lb. quoted for both spot and shipments.

Bleaching Powder — The larger call for liquid chlorine, combined with the high price for bleach on contract as compared with the figure for last year, has resulted in a rather quiet market. Many large consumers are not covered far ahead and evidently are not satisfied that values will hold at present levels. It is admitted that surplus stocks are held at works but there is no indication of selling pressure and nothing in sight to warrant belief in a reduction in prices. The contract figure remains at $1.90 per 100 lb. in large drums, carlots, at works.

Barium Chloride — Buying has been limited and imported chloride has been available on spot at $61 per ton with a possibility of doing the same on shipments. The carbonate has been quoted at $53@$54 per ton on spot with these prices easy and subject to shading.

Sal Ammoniac — This material has been in demand for some time and the buying movement has included both domestic and foreign grades. Some consumers give the preference to the home product and are not influenced by price considerations in favor of the imported material. Domestic grades of white sal ammoniac are quoted at 7@7½c. per lb., at works, with gray at 8@8½c. per lb. Imported white is held at 6@6½c. per lb. on spot and 5⅞@6c. per lb. for shipment. The gray is offered at 7¼@7½c. per lb., with shipments at 7c. per lb.

Sulphate of Ammonia—Enlarged operations at producing plants have not yet made any substantial gains over consumption and producers have very little surplus to offer for new accounts. The quotation is repeated at $2.75@$2.80 per 100 lb. in bulk at works. Export prices are purely nominal. Imported synthetic sulphate is finding a good outlet with sellers quoting $2.85@$2.90 per 100 lb. in bulk for large lots.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	160.25
Last week	160.09
Jan., 1924	166.00
Jan., 1923	173.00
Jan., 1922	144.00
Jan., 1921	181.00
Jan., 1920	242.00
Jan., 1919	262.00
Jan., 1918	281.00

Higher prices for tin salts and linseed oil are reflected in the 16 point advance in the weighted index number.

Alcohol

A firm situation exists in denatured alcohol, stocks being subnormal for this time of the year. Demand continues fairly active, especially for the anti-freezing grades. First hands announced no price changes. Completely denatured, formula No. 5, 188 proof, held at 55@55½c. per gal., in drums, carload lots.

Butanol for shipment from works, carload lots, was available at 26@27c. per lb., with inquiry good.

Methanol was quiet and prices barely steady on rather keen competition. Pure methanol, tank cars, was nominal at 74c. per gal., with 97 per cent material nominal at 72c. per gal., in drums, carload lots.

Coal-Tar Products

Crudes Steady Despite Slow Trading—Contract Call for Aniline Oil Improves—Creosote Firmer Abroad

DEVELOPMENTS at producing centers were of little moment in the market for coal-tar crudes. Production in December showed a moderate gain, but demand for most of the crudes was sufficient to absorb the additional offerings and the undertone remained steady. In the past week the call was slow, most buyers holding off until after the holiday period. The advance in crude petroleum was regarded as a favorable development inasmuch as this should impart greater stability to gasoline. A higher market for the petroleum product would benefit producers of motor benzene. Buying interest in aniline oil has steadied prices in all quarters and there was talk of a possible advance in this item. Consumers were buyers of aniline oil for shipment over the whole of 1925. Contract business in naphthalene again was inactive, but prices held on a fairly steady basis, producers taking the stand that reduction in prices would not stimulate buying. A shipment of crude naphthalene arrived from Germany. Spot offerings of U.S.P. phenol were reported at 23c. per lb., indicating that the market has eased a trifle. Advices from abroad reported a firmer situation in creosote oil. Cresylic acid was offered quite freely by domestic producers and prices presented a more or less unsettled appearance. Pyridine was barely steady on quiet trading.

Aniline Oil and Salt—Improved demand has absorbed most of the surplus holdings and the market is firmer in all directions. Contracting has taken on larger proportions, first hands reporting sales for whole of 1925 shipment at the old scale of prices. The market held at 16c. per lb., drums extra, carload lots, works. Aniline oil for red was nominal at 40c. per lb. Aniline salt was inactive, but steady at 22@23c. per lb.

Benzene—Demand was slow, so far as new business was concerned, but with no accumulation in supplies, prices ruled steady. Contract deliveries of the motor fuel grades have been large enough to absorb the bulk of the output. Leading factors quote the market unchanged at 23c. per gal. on the 90 per cent material, and 25c. per gal. on the pure, tank cars, f.o.b. works.

Creosote—Trading has taken place in the English market at 5¾d. per gal., loose, f.o.b. point of production, with the undertone firm on inquiry from America.

Cresylic Acid—Offerings liberal and prices unsettled, favoring buyers. Quotations on the 97 per cent grade ranged from 59@63c. per gal., in drums, the inside price obtaining on carload lots, works.

H-Acid — Demand slackened, but prices underwent no change, holding at 70@74c. per lb., as to quantity and seller.

Naphthalene—Producers were not inclined to push sales, and this was reflected by rather steady prices for refined flake and ball. Demand, on the other hand, was disappointing. Flake, pure white, held at 5½c. per lb., with ball at 6½c. per lb., in bbl. Chipped in moderate request, but prices were subject to negotiation. Crude for shipment from abroad nominal at 2c. per lb., c.i.f. New York.

Paranitraniline — Some traders reported slight improvement in demand. Prices, however, did not change, holding at 65@70c. per lb., according to seller.

Phenol—There were sellers of U.S.P. phenol on spot at 23c. per lb., large drums. Others continued to name 24c. as inside. Demand has been less active, resulting in freer offerings. On contract it was reported that 23c. could be shaded.

Pyridine — Demand was quiet, and this resulted in scattered offerings at concessions. At the close the nominal prices asked ranged from $3.75@$4 per gal. On futures $3.50 might have been done.

Solvent Naphtha—No selling pressure, despite routine nature of business. Leading sellers quote 24c. per gal. on the water-white, tank cars, f.o.b. works.

Vegetable Oils and Fats

Crude Cottonseed Steady—Linseed Advances—Palm Oils Higher—Olive Foots Strong—Tallow and Greases Up

TRADING was inactive, but light offerings of most of the technical oils caused prices to hold on a comparatively firm basis. In the past week tallow was sold to soapmakers at the highest price in years. The strength in tallow was instrumental in bringing about a higher trading level for all of the palm oils. Flaxseed sold at new highs for the season and crushers came out with higher prices for linseed oil. Olive oil foots moved into a strong position. Refined cottonseed was higher early in the week, but, on liquidation, eased off closing practically unchanged.

Castor Oil—Offerings of spot material continued light and with no important change in the castor bean situation, crushers regarded the market as firm. Leading makers quote 17c. per lb., in bbl., on the No. 3 grade.

Cottonseed Oil—Net changes in prices for cottonseed oil, both crude and refined, were insignificant, and the undertone of the market remained quite firm. Daily price fluctuations reflected the course of speculative commodity markets rather closely, with lard, as in the past, playing a most important part. Commission houses were buyers of May and July oil in the option market, with refiners' brokers active on the selling end. Refiners were able to sell July oil on a spread with crude amounting to 245 points. January oil, prime summer yellow, settled at 11.45c. bid, with May at 11.98c. bid, Produce Exchange terms. Crude cottonseed oil sold at 10c. per lb., tanks, f.o.b. mills, Southeast, 9½c. per lb., tanks, Valley, and 9¾c. per lb., tanks, Texas, immediate shipment. Bleachable oil was nominal at 10⅝c. per lb., tank cars, Texas common points. Cash trade in refined oil was fair, but export call was quiet, the recent advance restricting business. Lard compound met with a steady call and prices ruled firm at 13¾@14c. per lb., carlots, N. Y., f.o.b. Pure lard in Chicago was firm, the May production settling at 17.15c per lb.

Linseed Oil—A little inquiry was aroused for second quarter deliveries, but business booked was not large. The strength in seed brought about another advance in oil prices, the uplift affecting all positions and amounting to 2c. per gal. This establishes the market for raw oil for immediate delivery at $1.15 per gal., cooperage basis, car load lots. March-April settled at $1.16 per gal., with May-June at $1.17 per gal. Consumers appeared less anxious to anticipate in their wants, as news from the Argentine has been more encouraging. Quite a number of traders now look for an exportable surplus from the new Argentine crop of 40,000,000 bu. minimum. The receipts of new seed at interior points in the South American flax belt have increased and this resulted in freer offerings. February shipment seed at Buenos Aires settled on Wednesday at $2.38½, with March at $2.40 per bu. Duluth prices for seed made new highs for the movement. Late in the week the January option at Duluth was quoted at $3.03 per bu., while May stood at $3.07 per bu. Receipts of domestic seed at the Northwestern terminals so far this season amounted to 24,500,000 bu. out of an estimated production of 30,173,000 bu. Linseed cake for export closed at $48 per ton, f.a.s. New York.

China Wood Oil—Trading was inactive, but prices were firm on steadiness at primary centers. Spot oil was offered at 15½c. per lb., in bbl., with nearby material at 15¼c. per lb. Cables from China quoted 16c. per lb., New York basis.

Argentine Flaxseed Exports Largest on Record

Shipments of flaxseed from the Argentine to all countries from Jan. 1 to Dec. 26 amounted to 58,135,000 bu., which compares with 43,608,000 bu. for the corresponding period a year ago. The 1924 exports constitute a new record and indicate that the total crop of 1923-24 was in excess of 65,000,000 bu. Exports for the Jan. 1 to Dec. 26 period, by countries, with a comparison, follow:

	1924	1923
United Kingdom	7,612,000	3,540,000
Continent	26,026,000	13,904,000
United States	14,435,000	20,880,000
To order	*10,062,000	*5,284,000
Total	58,135,000	43,608,000

*Shipped to U. K. and Continent.

Corn Oil—Crude oil sold in Chicago at 10½c. per lb., tank car basis, an advance of ⅛c.

Coconut Oil—Offerings were scanty, both here and on the Pacific coast and a firm undertone featured the market. Ceylon type oil for immediate shipment closed at 10⅝c. per lb., tanks, New York. On the coast 10½c. was asked for January-February oil, tank car basis, with 10c. asked on March-April and 9¾c. on May forward.

Olive Oil Foots—Scattered lots sold at 9¾@10c. per lb., in bbl., with the market firmer.

Palm Oils—Interest centered in the advance in tallow and holders of spot and nearby oil were inclined to withdraw from the market. Closing prices were nominal at 9¾@10c. per lb. for Lagos and 9¼c. per lb. for Niger.

Palm Kernel Oil — Shipment from abroad closed at 10⅝c. asked, in bbl., c.i.f. New York. Some inquiry in evidence.

Rapeseed Oil—Refined oil was offered on spot at 96@97c. per gal., in bbl.

Soya Bean Oil—There were offerings at 11¼c. per lb., tank cars, duty paid, f.o.b. Pacific coast ports, nearby delivery.

Tallow, Etc.—The sale of a moderate quantity of extra special tallow established the market at 11c. per lb., loose, works.

Miscellaneous Materials

Antimony—Trading was fairly active, despite the advance in prices. Chinese antimony on spot sold at 17½c. per lb., which compares with 15c. a week ago. Oriental markets were higher. Cookson's "C" grade nominal at 17½@18½c. per lb. Standard powdered needle, 200 mesh, 11½@11¾c. per lb. White oxide, Chinese, 99 per cent, 13@14c. per lb. Spot stocks of metal scanty and market excited.

Bismuth — Market easy on selling pressure. The metal was offered at $1.25@$1.30 per lb. London quotes 5s. per lb.

Barytes—White floated steady at $23 per ton, packages included, carload lots, f.o.b. St. Louis. Water ground, 300 mesh, in bags, $21 per ton, Charlotte, N. C. Crude $6.50@$8 per ton, f.o.b. S. C. points.

Bauxite — Domestic, crushed and dried, $5.50@$8.75 per ton; pulverized and dried, $14 per ton; calcined, crushed, $19@$20 per ton. French bauxite, red, $5@$7 per ton, c.i.f. Atlantic ports. Adriatic, $5@$7.50 per ton, c.i.f. basis.

Glycerine—With basic materials moving higher, the market for glycerine continues firm. Recent business in dynamite was placed at 18½c. per lb., carload lots, f.o.b. point of production, but there were no offerings late last week under 18½c. Chemically pure was firm at 19@19½c. per lb., in drums, f.o.b. New York. Crude soap-lye, basis 80 per cent, was offered at 12½c. per lb., loose, f.o.b. Middle West, but supplies available small. Saponification, 88 per cent, 13½c. per lb., loose, carload lots.

Lithopone—In spite of rather keen competition for business prices held on a steady basis, both for prompt and forward deliveries. Makers report that business on their books for first half of 1925 delivery is larger than at this time a year ago and the market is in a satisfactory position. Most of the business placed was closed at 6c. per lb., in bags, although some sellers did sell as low as 5¾c. per lb.

Naval Stores — Trading inactive in spirits of turpentine and market was slightly lower at 84@84½c. per gal., in bbl. Movement of rosins on contract up to normal and prices ruled firm, the lower grades settling at $7.60@$7.70 per bbl.

Shellac—Arrivals increased and this caused spot prices to ease off a little. Foreign markets were unsettled. T. N. shellac offered at 63c. per lb., with bleached, bonedry, at 73@74c. per lb.

White Lead—The price of pig lead was raised to 9.60c. per lb., a net gain of 10 points. The advance in the metal strengthened the market for pigments, but brought out no change in the selling basis. Standard dry white lead, carload lots, 11c. per lb. Supersublimed 11c. per lb., and sublimed 10½c. per lb. Dry red lead firm at 12¾c. per lb.

Zinc Oxide—There was a steady market for the different grades of zinc oxide. Consumption has made gains, the rubber trade being more active. Paint manufacturers have been taking usual quantities. American process, lead free, 7⅝c. per lb., in bags, carload lots. French process, red seal, 9⅝c. per lb., in bags.

Imports at the Port of New York

December 26 to December 31

ACIDS — Cresylic — 92 dr., Glasgow, American-Hawaiian S.S. Co.; 30 dr., Glaskow, United American Lines. **Formic**—147 carboys, Hamburg, A. Klipstein & Co. **Lactic**—27 bbl., Hamburg, International Acceptance Bank. **Oxalic**—38 csk., Hamburg, Industrial Trust Co. **Tartaric**—100 csk., Palermo, Leghorn Trading Co.; 100 csk., Palermo, Order. **Phosphoric**—52 dr., Hamburg, East River National Bank. **Stearic**—83 pkg., Rotterdam, Order.

ALCOHOL—17 dr., Hamburg, Order; 22 dr. denatured, Arecibo, C. Estevas; 25 bbl. do., San Juan, Order.

ALUMINUM SULPHATE—42 csk., Liverpool, Order.

AMYL ACETATE — 15 dr. technical, Hamburg, East River National Bank.

ANTIMONY—160 csk., Hamburg, Order; 250 cs., Hamburg, Order; 830 bg., Antofagasta, W. R. Grace & Co.

ANTIMONY CARBONATE — 30 csk., Hamburg, A. Klipstein & Co.

ANTIMONY SULPHURET—7 csk., London, Order; 17 csk., Hull, S. Fullwood.

ARSENIC — 200 dr. white, Hamburg, Chemical National Bank; 100 dr., Hamburg, Chemical National Bank; 25 dr. red, Hamburg, Bank of America.

BARIUM CHLORIDE — 53 bbl., Hamburg, A. Klipstein & Co.

BARYTES—141 csk., Hamburg, A. Hurst & Co.; 120 bg., Genoa, Order; 250 bg., Hamburg, A. Klipstein & Co.; 120 csk., Rotterdam, Order.

BLANC FIXE—13 csk., Hamburg, E. M. & F. Waldo.

CALCIUM CHLORIDE—104 dr., Hamburg, E. Suter & Co.; 154 dr., Hamburg, Coal & Iron National Bank.

CAMPHOR—175 cs., Hamburg, Equitable Trust Co.

CASEIN—250 bg., Buenos Aires, Order; 417 bg., Buenos Aires, National City Bank; 300 bg., Bordeaux, Equitable Trust Co.

CHALK—3,040 bg. and 24 bbl., Antwerp, National City Bank; 300 bg., Antwerp, L. H. Butcher & Co.; 1,206 bg., Havre, Cooper & Cooper; 830,000 kilos, Dunkirk, Taintor Trading Co.; 500,000 kilos, Dunkirk, J. W. Higman Co.

COLORS—2 csk. dry, London, Siemon & Elting; 3 csk. vermilion, London, C. H. Powell & Co.; 17 csk. ultramarine blue, Glasgow, A. Maharrie; 6 cs., Southampton, B. F. Drakenfeld & Co.; 9 csk., Hamburg, A. Hurst & Co.; 14 bbl. aniline, Genoa, Irving Bank-Col. Trust Co.; 10 pkg. do., Genoa, Order; 13 csk. aniline, Rotterdam, Kuttroff, Pickhardt & Co.; 58 csk. aniline, Rotterdam, H. A. Metz & Co.; 227 pkg. aniline, etc., Rotterdam, Grasselli Dyestuff Corp.; 5 csk. aniline, Rotterdam, Fidelity-Intl. Trust Co.; 15 csk. earth, Rotterdam, Meteor Products Co.; 16 pkg. aniline, Hamburg, Franklin Import & Export Co.; 16 pkg. do., Hamburg, Kuttroff, Pickhardt & Co.; 14 esk., Hamburg, A. Hurst & Co.

COAL-TAR DISTILLATE — 126 dr., Liverpool, Order.

COPPER OXIDE — 160 dr., Hamburg, Order.

CHEMICALS—274 pkg., Glasgow, Brown Bros. & Co.; 28 csk., Glasgow, Order; 225 bg. and 67 cs., Hamburg, Jungmann & Co.; 95 csk., Hamburg, Pfaltz & Bauer; 97 csk., Rotterdam, Kidder, Peabody & Co.; 6 bbl., Hamburg, Fezandie & Sperrle; 100 cs., Hamburg, Norvell Chemical Co.; 5 cs., Hamburg, Jungmann & Co.; 10 cs., Hamburg, J. Munroe & Co.; 6 csk., Hamburg, Ludwig Baer; 215 cs., Hamburg, Roessler & Hasslacher Chem. Co.

EPSOM SALT—500 bg., Hamburg, Brown Bros. & Co.; 500 bg., Hamburg, Order.

FERROCHROME — 62 cs., Copenhagen, Order.

FULLERS EARTH—217 bg., Hamburg, A. Hurst & Co.

FUSEL OIL—2 bbl., Hamburg, Williamson & Co.; 17 csk., Hamburg, Order.

GLYCERINE—20 csk. crude, Bordeaux, Order.

GRAPHITE—87 bg., Marseilles, H. W. Peabody & Co.

GUMS—98 bg. tragacanth, London, Bank of Montreal; 36 bg. copal, London, S. Winterbourne & Co.; 242 bg. karaya, Bombay, Order; 1,000 bg. arabic, Port Sudan, Order; 1,000 cs. damar, Batavia, Stein, Hall & Co.; 150 cs. damar and 128 bg. copal, Singapore, L. C. Gillespie & Sons; 310 pkg. damar, Singapore, Order; 476 bg. copal, Antwerp, Order.

IRON OXIDE—30 csk., Liverpool, J. A. McNulty; 228 bbl., Malaga, W. Schall & Co.; 154 bbl., Malaga, C. J. Osborn Co.; 100 bbl., Malaga, E. M. & F. Waldo; 72 bbl., Malaga, Reichard, Coulston, Inc.; 60 bbl., Malaga, E. E. Marks Co.; 294 bbl., Malaga, C. K. Williams & Co.; 140 bbl., Malaga, Order; 5 csk., Hull, J. Lee Smith & Co.; 17 csk., Manchester, Order.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

ALCOHOL, denatured. Alexandria, Egypt. Purchase and agency.—12,907.

ALUM, in lumps, and liquid chlorine. Quebec, Canada. Purchase.—12,911.

CARBON BLACK and wood chemicals. Brussels, Belgium. Agency.—12,923.

LEAD, red and white. London, England. Agency.—12,914.

ROSIN and caustic soda. Bahia, Brazil. Purchase.—12,917.

SULPHATE OF AMMONIA. Chatham, Canada. Purchase.—12,855.

LITHOPONE—80 csk., Rotterdam, L. H. Butcher & Co.

MAGNESITE—120 bbl. and 250 bg. calcined, Rotterdam, Brown Bros. & Co.

MAGNESIUM CHLORIDE — 40 csk., Glasgow, A. Klipstein & Co.; 88 dr., Hamburg, Brown Bros. & Co.; 106 dr., Hamburg, Order; 88 bbl., Hamburg, Order.

MANGROVE BARK—500 bg., Singapore, Order.

MENTHOL SYNTHETIC—5 cs., London, McKesson & Robbins.

MYROBALANS — 948 pkt., Calcutta, Standard Bank of South Africa; 3,518 pkt., Bombay, Order; 300 bg. and 4,748 pkt., Calcutta, Order; 8,000 pkt., Calcutta, Order; 400 bg., Calcutta, Order; 1,522 bg., Calcutta, National City Bank.

NAPHTHALENE — 488 bg., Hamburg, Order.

NUX VOMICA — 1,000 pkt., Calcutta, Order.

OCHER — 18 csk., Marseilles, Reichard, Coulston, Inc.; 18 csk., Marseilles, J. Lee Smith & Co.; 85 csk., Marseilles, American Exchange National Bank.

OILS—Cod—200 bbl., Hull, R. Badcock & Co.; 200 bbl., Aberdeen, Order. **Coconut**—642 tons, Manila, Philippine Refining Co. **Palm kernel**—55 csk., Liverpool, C. Hollinsted & Co.; 21 csk., Hamburg, Order; 251 bbl., Hull, Order. **Palm**—28 bbl. and 144 csk., Liverpool, Core & Herbert; 217 csk., Liverpool, Guaranty Trust Co.; 90 bbl., Liverpool, Order; 79 csk., Hamburg Standard Bank of South Africa; 79 csk., Hamburg, Order; 78 csk., Liverpool, United American Lines; 164 csk., Liverpool, Order; 237 csk., Hamburg, Order; 228 csk., Hamburg, Order; 346 csk., Hamburg, African & Eastern Trading Co.; 151 csk., Hamburg, Order; 100 csk., Liverpool, Guaranty Trust Co.; 20 csk., Liverpool, African & Eastern Trading Co.; 269 csk. and 30 bbl., Liverpool, Order; 963 csk., Lagos, Order. **Rapeseed**—50 bbl., Hull, Baring Bros. & Co.; 400 bbl., Hull, Order. **Soya Bean**—407 dr., Hamburg, Order.

OILSEEDS — Castor — 4,991 bg., Bombay, Volkart Bros.; 5,606 bg., Bombay, Order; 17 bg., Port au Prince, S. L. Brinley; 19 bg., Port de Paix, W. & A. Leaman.

PHOSPHORUS SULPHIDE — 10 cs., Liverpool, Uniform Chemical Products Co.

POTASSIUM SALTS — 16 pkg. bromide, Hamburg, Kachurin Drug Co.; 84 dr. caustic, Hamburg, Ammerman & Patterson; 500 csk. chlorate, Hamburg, Irving Bank-Col. Trust Co.; 14 csk. carbonate, Hamburg, Parsons & Petit; 185 dr. caustic, Hamburg, A. Klipstein & Co.; 1,550 csk. chlorate, Hamburg, Irving Bank-Col. Trust Co.; 360 dr. caustic, Hamburg, Roessler & Hasslacher Chem. Co.; 380 bbl. nitrate, Hamburg, E. Suter & Co.; 20 cs. bromide, Hamburg, Lo Curto & Funk; 53 dr. permanganate, Hamburg, Order; 300 kegs chlorate, Hamburg, Order; 1,016 csk. nitrate, Hamburg, Kuttroff, Pickhardt & Co.; 1 pkg. alum, Hamburg, Order; 168 csk. nitrate, Hamburg, Kuttroff, Pickhardt & Co.; 121 bbl. salts, Hamburg, Innes, Speiden & Co.; 1,500 csk. chlorate, Hamburg, Seaboard National Bank.

PLUMBAGO—330 bg., Colombo, Order; 339 bbl., Colombo, Order; 165 bbl., Colombo, Paterson, Boardman & Knapp.

PUMICE—1,325 bg. powdered, Canneto Lipari, Whittaker, Clark & Daniels; 250 bg. do., Canneto Lipari, C. B. Chrystal & Co.; 1,236 bg. lump and 70 bg. powdered, Canneto Lipari, Griffiths & Co.; 748 bg. lump, Canneto Lipari, R. J. Waddell & Co.; 652 pkg., Canneto Lipari, Order.

PYRIDINE — 5 dr., Hamburg, R. W. Greeff & Co.; 7 dr., Hamburg, Order.

QUICKSILVER — 300 flasks, Leghorn, Leghorn Trading Co.; 200 flasks, Leghorn Order; 33 csk., Tampico, Haas Bros.

QUEBRACHO—2,169 bg., Buenos Aires, Commonwealth Atlantic National Bank; 2,589 bg., Buenos Aires, American Tanners, Ltd.; 78,588 bg., Buenos Aires, Tannin Corp.

SAL AMMONIAC — 112 bbl., Hamburg, Order; 8 csk., Hamburg, Lo Curto & Funk.

SHELLAC — 100 bg., Calcutta, Brown Bros. & Co.; 100 bg., Calcutta, Bank of London & South Am.; 413 bg., Calcutta, Marx & Rawolle; 1,362 bg., Calcutta, South American Trust Co.; 1,501 bg., Calcutta, Order; 400 bg., Calcutta, Bank of N. Y.; 500 bg., Calcutta, National City Bank; 1,125 bg., Calcutta, Order; 125 bg., Hamburg, Ralli Bros.; 1,472 bg., Calcutta, Philadelphia National Bank; 2,106 bg., Calcutta, Order.

SILICEOUS EARTH—406 bg., Hamburg, Chaplain & Bibbo.

SODIUM SALTS — 216 csk. nitrate, Christiania, Order; 60 cs. cyanide, Liverpool, Order; 7,158 bg. nitrate, Antofagasta, Anglo-South American Trust Co.; 7,146 bg. do., Antofagasta, Antony Gibbs & Co.; 7,075 bg. do., Iquique, Anglo-South American Trust Co.; 50 cs. bromide, Hamburg, H. W. Peabody & Co.; 22 csk. prussiate, Liverpool, C. Tennant Sons & Co.; 8 csk. prussiate, Hamburg, A. Klipstein & Co.; 100 cs. bromide, Hamburg, Seaboard National Bank; 1,435 cs. cyanide, Hamburg, Roessler & Hasslacher Chem. Co.; 156 dr. sulphite, Hamburg, C. S. Grant & Co.; 132 dr. sulphate, Rotterdam, C. S. Grant & Co.; 100 csk. and 50 kegs hydrosulphite, Rotterdam, H. A. Metz & Co.; 27 csk. prussiate, Rotterdam, A. Klipstein & Co.; 25 cs. bromide, Hamburg, Order; 200 csk. chlorate, Hamburg, Seaboard National Bank; 119 cs. cyanide, Liverpool, Order; 7,077 bg. nitrate, Iquique, etc., W. R. Grace & Co.

STARCH—1,250 bg. potato, Copenhagen, Stein, Hall & Co.; 1,200 bg., Copenhagen, Equitable Trust Co.; 275 bg., Copenhagen, Order.

SUMAC—350 bg. ground, Palermo, New York Trust Co.; 1,050 bg. ground, Palermo, Order.

TALC—500 bg., Bordeaux, Hammill & Gillespie; 1,100 bg., Bordeaux, L. A. Salomon & Bro.

TARTAR—48 bg., Palermo, A. Russo & Co.; 229 bg., Marseilles, C. Pfizer & Co.; 100 bg., Marseilles, Royal Baking Powder Co.; 252 bg., Tarragona, Order; 377 bg., Buenos Aires, Tartar Chemical Works; 255 bg., Bordeaux, American Express Co.

VANADIUM ORE — 4,400 bg., Callao, Vanadium Corp. of Am.

WAXES—22 bg. beeswax, San Antonio, Order; 134 bg. carnauba, Ceara, Order; 20 bg. beeswax, Valparaiso, W. R. Grace & Co.

WHITING — 5,929 bg. powdered, Dunkirk, Taintor Trading Co.

WOOL GREASE—67 bbl., Bergen, Hummel & Robinson; 50 bbl., Bergen, Order; 80 bbl., Hull, Marden, Wild Corp.; 200 bbl., Hull, American-Hawaiian S.S. Co.

ZINC OXIDE—50 bbl., Antwerp, Philipp Bros.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are first-hand quotations in the New York market for industrial chemicals, coal-tar products and related materials used in the industries that produce

Dyes	**Paper and Pulp**
Paint and Varnish	**Petroleum**
Ceramic Materials	**Soap**
Fertilizers	**Explosives**
Rubber	**Food Products**
Sugar	**Metal Products**

Whenever available these prices are those of the American manufacturer. If for material f.o.b. works or on a contract basis, quotations are so designated. All prices refer to large quantities in original packages.

Industrial Chemicals

Acetone, drums, works	lb.	$0.12 –	$0.12½
Acetic anhydride, 85 %, dr	lb.	.36 –	.38
Acid, acetic, 28%, bbl.	100 lb.	3.12 –	3.37
Acetic, 56%, bbl.	100 lb.	5.85 –	6.10
Acetic, 80%, bbl.	100 lb.	8.19 –	8.44
Glacial, 99½%, bbl.	100 lb.	11.01 –	11.51
Boric, bbl.	lb.	.09 –	.09½
Citric, kegs	lb.	.45½–	.46½
Formic, 85%	lb.	.10½–	.10½
Gallic, tech.	lb.	.45½–	.47
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.13½–	.14
22% tech., light, bbl.	lb.	.06½–	.07
Muriatic, 18° tanks	100 lb.	.80 –	.85
Muriatic, 20°, tanks	100 lb.	.95 –	1.00
Nitric, 36°, carboys	lb.	.04 –	.04½
Nitric, 42°, carboys	lb.	.04½–	.05½
Oleum, 20%, tanks	ton	16.00 –	17.00
Oxalic, crystals, bbl.	lb.	.09½–	.09½
Phosphoric, 50% carboys	lb.	.07½–	.07½
Pyrogallic, resublimed	lb.	1.55 –	1.60
Sulphuric, 60°, tanks	ton	8.00 –	9.00
Sulphuric, 60°, drums	ton	12.00 –	13.00
Sulphuric, 66°, tanks	ton	13.00 –	14.00
Sulphuric, 66°, drums	ton	17.00 –	18.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.27½–	.28
Tartaric, domestic, bbl.	lb.	.29 –	.30
Tungstic, per lb.	lb.	1.20 –	1.25
Alcohol, butyl, drums, wks.	lb.	.27 –	.30
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.89 –	.....
Denatured, 190 proof No. 1, special bbl.	gal.	.61 –	.....
No. 1, 190 proof, special, dr.	gal.	.55 –	.....
No. 1, 188 proof, bbl.	gal.	.65 –	.....
No. 1, 188 proof, dr.	gal.	.58 –	.....
No. 5, 188 proof, bbl.	gal.	.60 –	.....
No. 5, 188 proof, dr.	gal.	.55 –	.....
Alum, ammonia, lump, bbl.	lb.	.03½–	.04
Potash, lump, bbl.	lb.	.02½–	.03½
Chrome, lump, potash, bbl.	lb.	.05½–	.06
Aluminum sulphate, com., bags	100 lb.	1.40 –	1.45
Iron free, bags	lb.	2.40 –	2.45
Aqua ammonia, 26°, drums	lb.	.06½–	.06¾
Ammonia, anhydrous, cyl.	lb.	.28 –	.30
Ammonium carbonate, powd. tech., casks	lb.	.12½–	.12½
Nitrate, tech., casks	lb.	.09 –	.10
Amyl acetate tech., drums	gal.	3.25 –	3.50
Antimony oxide, white, bbl.	lb.	.13 –	.14
Arsenic, white, powd., bbl.	lb.	.06½–	.06¾
Red, powd., kegs	lb.	.14½–	.15½
Barium carbonate, bbl.	ton	54.00 –	55.00
Chloride, bbl.	ton	64.00 –	70.00
Dioxide, 88%, drums	lb.	.17½–	.18
Nitrate, casks	lb.	.07½–	.08¼
Blanc fixe, dry, bbl.	lb.	.03½–	.03¾
Bleaching powder, f.o.b. wks., drums, contract	100 lb.	1.90 –	.....
Spot, wks., drums	100 lb.	2.00 –	2.15
Borax, bbl.	lb.	.05 –	.05½
Bromine, cases	lb.	.44 –	.45
Calcium acetate, bags	100 lb.	3.00 –	3.05
Arsenate, dr.	lb.	.08 –	.08½
Carbide, drums	lb.	.05 –	.05½
Chloride, fused, dr. wks.	ton	21.00 –	.....
Gran. drums works	ton	27.00 –	.....
Phosphate, mono, bbl.	lb.	.06½–	.07½
Carbon bisulphide, drums	lb.	.06 –	.06½
Tetrachloride, drums	lb.	.06½–	.07½
Chalk, precip.—domestic, light, bbl.	lb.	.04½–	.04½
Imported, light, bbl.	lb.	.04½–	.05
Chlorine, liquid, tanks, wks.	lb.	.04½–	.....
Contract, tanks, wks.	lb.	.04 –	.....
Cylinders, 100 lb., wks.	lb.	.05½–	.07½
Cobalt, oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	15.00 –	16.00
Copper carbonate, bbl.	lb.	.17 –	.17½
Cyanide, drums	lb.	.49 –	.50
Oxide, kegs	lb.	.16½–	.16½
Sulphate, dom., bbl.	100 lb.	4.65 –	4.75
Imp. bbl.	100 lb.	4.50 –	.....
Cream of tartar, bbl.	lb.	.20½–	.21
Epsom salt, dom., bbl.	100 lb.	1.75 –	2.00
Imp., tech., bags	100 lb.	1.35 –	1.40
U.S.P., dom., bbl.	100 lb.	2.10 –	2.35
Ether, U.S.P., dr concent'd.	lb.	.15 –	.16
Ethyl acetate, 85%, drums	gal.	.92 –	.95
Acetate, 99%, dr.	gal.	1.08 –	1.10
Formaldehyde, 40%, bbl.	lb.	.09 –	.09½
Fullers earth—f.o.b. mines	ton	7.50 –	18.00
Furfural, works, bbl.	lb.	.23 –	.....
Fusel oil, ref., drums	gal.	4.00 –	4.50
Crude, drums	gal.	3.00 –	3.25
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Imp., bags	100 lb.	.80 –	.90
Glycerine, c. p., drums extra	lb.	.19 –	.19½
Crude 80%, loose	lb.	.12½–	.....
Hexamethylene, drums	lb.	.65 –	.67
Lead:			
White basic carbonate, dry, casks	lb.	$0.11 –	.....
White, basic sulphate, casks	lb.	.10½–	.....
White, in oil, kegs	lb.	.1276–	.....
Red, dry, casks	lb.	.12½–	.....
Red, in oil, kegs	lb.	.1397–	.....
Acetate, white crys., bbl.	lb.	.15½–	.....
Brown, broken, casks	lb.	.14½–	.....
Arsenate, white crys., bbl.	lb.	.16 –	$0.18
Lime-Hydrated, b.g., wks.	ton	10.50 –	12.50
Bbl., wks.	ton	18.00 –	19.00
Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.12½–	.....
Lithopone, bags	lb.	.06 –	.06½
Magnesium carb., tech., bags	lb.	.07 –	.08
Methanol, 95%, drums	gal.	.70 –	.72
97%, drums	gal.	.72 –	.74
Pure, tanks	gal.	.74 –	.76
drums	gal.	.78 –	.80
bbl.	gal.	.83 –	.85
Methyl-acetone, t'ks	gal.	.70 –	.....
Nickel salt, double, bbl.	lb.	.10 –	.....
Single, bbl.	lb.	.10½–	.....
Orange mineral, cak.	lb.	.15½–	.16
Phosgene		.60 –	.75
Phosphorus, red, cases	lb.	.70 –	.75
Yellow, cases	lb.	.37½–	.40
Potassium bichromate, casks	lb.	.08½–	.08½
Bromide, gran., bbl.	lb.	.41 –	.48
Carbonate, 80–85%, calcined, casks	lb.	.06 –	.06½
Chlorate, powd.	lb.	.06½–	.08½
Cyanide, drums	lb.	.47 –	.52
First sorts, cask	lb.	.08½–	.08½
Hydroxide (caustic potash) drums	lb.	.07½–	.07½
Iodide, cases	lb.	3.65 –	3.75
Nitrate, bbl.	lb.	.06 –	.07½
Permanganate, drums	lb.	.14½–	.15
Prussiate, red, casks	lb.	.36½–	.38
Prussiate, yellow, casks	lb.	.16½–	.17
Salammoniac, white, gran., casks, imported	lb.	.05½–	.06
White, gran., bbl., domestic	lb.	.07 –	.07½
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20 –	1.40
Salt cake (bulk) works	ton	16.00 –	18.00
Soda ash, light 58% flat, bulk, contract	100 lb.	1.25 –	.....
bags, contract	100 lb.	1.38 –	.....
Dense, bulk, contract, basis 58%	100 lb.	1.35 –	.....
bags, contract	100 lb.	1.45 –	.....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 –	.....
Caustic, ground and flake, contracts, dr.	100 lb.	3.50 –	3.85
Caustic, solid, 76% f.a.s. N. Y.	100 lb.	2.90 –	3.05
Sodium acetate, works, bbl.	lb.	.05 –	.05½
Bicarbonate, bulk	100 lb.	1.75 –	.....
Bichromate, casks	lb.	.06½–	.06½
Bisulphate (niter cake)	ton	6.00 –	7.00
Bisulphite, powd., U.S.P., bbl.	lb.	.04½–	.04½
Bromide, bbl.	lb.	.42 –	.47
Chlorate, kegs	lb.	.06½–	.06½
Chloride	long ton	12.00 –	13.00
Cyanide, cases	lb.	.19 –	.22
Flouride, bbl.	lb.	.08½–	.09
Hyposulphite, bbl.	lb.	.02½–	.02½
Nitrite, casks	lb.	.09½–	.09½
Peroxide, powd., cases	lb.	.23 –	.27
Phosphate, dibasic, bbl.	lb.	.03½–	.03½
Prussiate, yel. bbl.	lb.	.09½–	.09½
Salicylate, drums	lb.	$0.38 –	$0.40
Silicate (40°, drums)	100 lb.	.75 –	1.16
Silicate (60°, drums)	100 lb.	1.75 –	2.00
Sulphide, fused, 60-62%, drums	lb.	.02½–	.03½
Sulphite, crys., bbl.	lb.	.03½–	.03½
Strontium nitrate, powd., bbl	lb.	.09½–	.10
Sulphur chloride, yel drums	lb.	.04½–	.05
Crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Flour, bag	100 lb.	2.25 –	2.35
Dioxide, liquid, cyl.	lb.	.08 –	.08½
Tin bichloride, bbl.	lb.	.15½–	.....
Oxide, bbl.	lb.	.61 –	.....
Crystals, bbl.	lb.	.38½–	.....
Zinc carbonate, bags	lb.	.12 –	.14
Chloride, gran., bags	lb.	.06 –	.07½
Cyanide, drums	lb.	.40 –	.41
Dust bbl.	lb.	.08 –	.08½
Oxide, lead free, bags	lb.	.07½–	.....
5% lead sulphate bags	lb.	.06½–	.....
French, red seal, bags	lb.	.09½–	.....
French, green seal, bags	lb.	.10½–	.....
French, white seal, bbl.	lb.	.11½–	.....
Sulphate, bbl.	100 lb.	3.25 –	3.50

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 –	$0.62
Alpha-naphthol, ref., bbl.	lb.	.75 –	.80
Alpha-naphthylamine, bbl.	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salt, bbl.	lb.	.22 –	.23
Anthracene, 80%, drums	lb.	.65 –	.70
Anthraquinone, 25%, drums	lb.	.65 –	.67
Benzaldehyde U.S.P., tech., drums	lb.	.69 –	.71
Benzene, pure, tanks, works	gal.	.25 –	.....
Benzene, 90%, tanks, works	gal.	.23 –	.....
Benzidine base, bbl.	lb.	.78 –	.80
Benzyl chloride, ref. carboys	lb.	.35 –	.....
Benzyl chloride, tech., drums	lb.	.25 –	.....
Beta-naphthol, tech., bbl.	lb.	.24 –	.25
Beta-naphthylamine, tech.	lb.	.65 –	.70
Cresylic acid, 97%, drums	gal.	.60 –	.63
95-97%, drums, works	gal.	.56 –	.58
Dichlorbenzene, drums	lb.	.07 –	.08½
Dinitrobenzene, bbl.	lb.	.15 –	.17½
Dinitrochlorbenzene, bbl.	lb.	.20 –	.21
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluen, bbl.	lb.	.18 –	.20
Dip oil, 25%, drums	gal.	.26 –	.28
H-acid, bbl.	lb.	.70 –	.74
Meta-phenylenediamine, bbl.	lb.	.90 –	.95
Monochlorbenzene, drums	lb.	.08½–	.10
Naphthalene, flake, bbl.	lb.	.05 –	.05½
Naphthionate of soda, bbl.	lb.	.60 –	.65
Naphthionic acid, crude, bbl.	lb.	.60 –	.62
Nitrobenzene, drums	lb.	.09 –	.09½
Nitro-naphthalene, bbl.	lb.	.25 –	.27
Nitro-toluene, drums	lb.	.13½–	.14
N-W acid, bbl.	lb.	1.10 –	1.15
Ortho-amidophenol, kegs	lb.	2.40 –	2.50
Ortho-dichlorbenzene, drums	lb.	.10 –	.11
Ortho-toluidine, bbl.	lb.	.17 –	.18
Para-aminophenol, base, kegs	lb.	1.15 –	1.20
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Para-nitraniline, bbl	lb.	.65 –	.67
Para-nitrotoluene, bbl.	lb.	.40 –	.42
Para-phenylendiamine, bbl.	lb.	1.25 –	1.35
Para-toluidine, bbl.	lb.	.70 –	.75
Phenol, U.S.P., dr.	lb.	.23 –	.25
Picric acid, bbl.	lb.	.20 –	.22
Pitch, tanks, works	ton	27.00 –	30.00
Pyridine, imp., drums	gal.	3.80 –	4.00
Resorcinol, tech., kegs	lb.	1.30 –	1.40
Resorcinol, pure, kegs	lb.	2.00 –	2.25
R-salt, bbl.	lb.	.50 –	.55
Salicylic acid, tech., bbl.	lb.	.32 –	.33
Salicylic acid, U.S.P., bbl.	lb.	.35 –	.....
Solvent naphtha, water-white, tanks	gal.	.24 –	.25
Crude, tanks	gal.	.21 –	.22
Sulphanilic acid, crude, bbl.	lb.	.16 –	.18
Tolidine, bbl.	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars, works	gal.	.26 –	.....
Toluene, drums, works	gal.	.31 –	.....
Xylidine, drums	lb.	.40 –	.42
Xylene, 5 deg.-tanks	gal.	.36 –	.40
Xylene, com., tanks	gal.	.24 –	.26

Naval Stores

Rosin B-D, bbl.	280 lb.	$7.60 –	$7.65
Rosin E-I, bbl.	280 lb.	7.65 –	7.70
Rosin K-N, bbl.	280 lb.	7.70 –	7.80
Rosin W.G.-W.W., bbl.	280 lb.	8.85 –	9.25
Turpentine, spirits of, bbl.	gal.	.85 –	.....
Wood, steam dist., bbl.	gal.	.78 –	.79
Wood, dest. dist., bbl.	gal.	.70 –	.74
Pine tar pitch, bbl.	200 lb.	5.50 –	.....
Tar, kiln burned, bbl.	500 lb.	12.00 –	12.50
Rosin oil, first run, bbl.	gal.	.45 –	.....
Pine tar oil, com'l.	gal.	.30 –	.....

Animal Oils and Fats

Degras, bbl.	lb.	$0.03½	$0.05½
Grease, yellow, loose	lb.	.10	.10½
Lard oil, Extra No. 1, bbl.	gal.	.96	.98
Lard compound, bbl.	lb.	.13½	.14
Neatsfootoil, 20 deg. bbl.	gal.	1.35	1.37
Oleo Stearine	lb.	.11½	.12
Oleo oil, No. 1, bbl.	lb.	.16	.16
Red oil, distilled, d.p. bbl.	lb.	.11½	....
Tallow, extra, loose works	lb.	.11	....
Tallow oil, acidless, bbl.	gal.	.92	.94

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.17	$0.17½
Castor oil, No. 1, bbl.	lb.	.17½	.17
Chinawood oil, bbl.	lb.	.15½	.16
Coconut oil, Ceylon, bbl.	lb.	.11½	.11
Ceylon, tanks, N. Y.	lb.	.10½	.10
Corn oil, crude, bbl.	lb.	.12½	....
Crude, tanks, (f.o.b. mill)	lb.	.10½	....
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.09½	.10
Summer yellow, bbl.	lb.	.11½	.12
Linseed oil, raw, car lots, bbl.	gal.	1.15	....
Raw, tank cars (dom.)	gal.	1.09	....
Boiled, cars, bbl. (dom.)	gal.	1.17	....
Olive oil, denatured, bbl.	gal.	1.18	1.22
Sulphur, (foots) bbl.	lb.	.09½	.10
Palm, Lagos, casks	lb.	.10	....
Niger, casks	lb.	.09½	....
Palm kernel, bbl.	lb.	.10½	.10½
Peanut oil, crude, tanks (mill)	lb.	.11½	.11½
Refined, bbl.	lb.	.16	.16½
Perilla, bbl.	lb.	.14½	.14½
Rapeseed oil, refined, bbl.	gal.	.96½	.97
Sesame, bbl.	lb.	.14½	.14½
Soya bean (Manchurian), bbl	lb.	.13½	....
Tank, f.o.b. Pacific Coast	lb.	.11½	.11½

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.64	$0.66
Menhaden, light pressed, bbl.	gal.	.70	.72
White bleached, bbl.	gal.	.72	.74
Crude, tanks (f.o.b. factory)	gal.	.53½	.55
Whale No. 1 crude, tanks, coast	lb.	....	....
Winter, natural, bbl.	gal.	.75	.76
Winter, bleached, bbl.	gal.	.78	.79

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.50	$0.55
Albumen, egg, tech, kegs	lb.	.90	.95
Cochineal, bags	lb.	.33	.35
Cutch, Borneo, bales	lb.	.04½	.05
Rangoon, bales	lb.	.13	.13½
Dextrine, corn, bags	100 lb.	4.67	4.87
Gum, bags	100 lb.	4.94	5.07
Divi-divi, bags	ton	42.00	43.00
Fustic, sticks	ton	30.00	35.00
Chips, bags	lb.	.04	.05
Gambier com., bags	lb.	.19½	.20
Logwood, sticks	ton	25.00	26.00
Chips, bags	lb.	.02½	.03
Sumac, leaves, Sicily, bags	ton	165.00	175.00
Domestic, bags	ton	50.00	55.00
Starch, corn, bags	100 lb.	4.02	4.29

Extracts

Archil, cone., bbl.	lb.	$0.16	$0.19
Chestnut, 25% tannin, tanks	lb.	.01½	.02½
Divi-divi, 25% tannin, bbl.	lb.	.05	.05
Fustic, liquid, 42°, bbl.	lb.	.08	.09½
Gambier, liq., 25% tannin, bbl.	lb.	.13½	.14
Hematine crys., bbl.	lb.	.14	.18
Hemlock, 25% tannin, bbl.	lb.	.03½	.04
Hypernic, liquid, 51°, bbl.	lb.	.12	.13
Logwood, crys., bbl.	lb.	.14	.15
Liq., 51°, bbl.	lb.	.07½	.08½
Osage Orange, 51°, liquid, bbl.	lb.	.07	.08
Quebracho, solid, 65% tannin, bbl.	lb.	.04½	.04½
Sumac, dom., 51°, bbl.	lb.	.06½	.06½

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, contract	lb.	$0.06	$0.08
spot, bags	lb.	.08	.12
Lampblack, bbl.	lb.	.12	.40
Mineral, bulk	ton	35.00	45.00
Blues–Prussian, bbl.	lb.	.35	.37
Ultramarine, bbl.	lb.	.08	.35
Browns, Sienna, Ital., bbl.	lb.	.05	.12
Sienna, Domestic, bbl.	lb.	.03	.03½
Umber, Turkey, bbl.	lb.	.04	.04½
Greens-Chrome, C.P.Light, bbl.	lb.	.29	.30
Chrome, commercial, bbl.	lb.	.10½	.11½
Paris, bulk	lb.	.24	.26
Reds, Carmine No. 40, tins	lb.	4.25	4.50
Iron oxide red, casks	lb.	.08	.12
Para toner, kegs	lb.	.95	1.00
Vermilion, English, bbl.	lb.	1.35	1.40
Yellow, Chrome, C.P. bbls.	lb.	.17	.17½
Ocher, French, casks	lb.	.02	.03

Waxes

Beeswax, crude, Afr. bg.	lb.	$0.33	$0.33½
Refined, light, bags	lb.	.36	.37
Candellila, bags	lb.	.32	.33
Carnauba, No. 1, bags	lb.	.36	.37
No. 2, North Country, bags	lb.	.29	.29½
No. 3, North Country, bags	lb.	.24	.25
Japan, cases	lb.	$0.15½	$0.16
Montan, crude, bags	lb.	.06	.06½
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.06	.06½
Crude, scale 124-126 m.p. bags	lb.	.05½	.05½
Ref., 118-120 m.p. bags	lb.	.05½	.06
Ref., 123-125 m.p., bags	lb.	.06	.06½
Stearic acid, agle. pressed, bags	lb.	.12½	.13
Double pressed, bags	lb.	.13½	.14

Fertilizers

Acid phosphate, 16%, wks.	ton	$7.50	$7.75
Ammonium sulphate, bulk f.o.b. works	100 lb.	2.75	....
Blood, dried, bulk	unit	3.85	3.95
Bone, raw, 3 and 50, ground	ton	26.00	28.00
Fish scrap, dom., dried, wks.	unit	5.00	....
Nitrate of soda, bags	100 lb.	2.46	2.47½
Tankage, high grade, f.o.b. Chicago	unit	3.10	3.20
Phosphate rock, f.o.b. mines			
Florida pebble, 68-72%	ton	3.00	3.50
Tennessee, 75%	ton	6.50	6.75
Potassium muriate, 80%, bags	ton	34.55	....
Sulphate, bags, 90%	ton	45.85	....
Double manure salt, bgs.	ton	26.35	....
Kainit, 14%, bgs.	ton	10.25	....

Crude Rubber

Para—Upriver fine	lb.	$0.36	$0.36½
Upriver coarse	lb.	.28	.28½
Plantation—First latex crepe	lb.	.40	....
Ribbed smoked sheets	lb.	.40	....

Gums

Copal, Congo, amber, bags.	lb.	$0.08	$0.10
East Indian, bold, bags	lb.	.13	.14
Manila, amber, bags	lb.	.14	.16
Damar, Batavia, cases	lb.	.28	.28½
Singapore, No. 1, cases	lb.	.30	.31
Singapore, No. 2, cases	lb.	.21	.21½
Kauri, No. 1, cases	lb.	.58	.64
Ordinary chips, cases	lb.	.21	.22
Manjak, Barbados, bags	lb.	.06	.12

Shellac

Shellac, orange fine, bags	lb.	$0.65	$0.66
Orange superfine, bags	lb.	.67	.68
Bleached, bonedry	lb.	.73	.74
T. N., bags	lb.	.62	.63

Miscellaneous Materials

Asbestos, crude No. 1 f.o.b., Quebec	sh. ton	$300.00	$350.00
Shingle, f.o.b., Quebec	sh. ton	45.00	50.00
Cement, f.o.b., Quebec	sh. ton	15.00	20.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	17.00	17.50
Grd., off-color, f.o.b., Balt	net ton	13.00	14.00
Floated, f.o.b., St. Louis, bbl.	net ton	23.00	24.00
Crude f.o.b. mines, bulk	net ton	8.50	9.00
Casein, bbl., tech.	lb	.11	.12
China clay (kaolin) crude, No. 1, f.o.b. Ga.	net ton	6.50	8.00
Powd., f.o.b. Ga.	net ton	12.00	16.00
Crude, f.o.b. Va.	net ton	5.50	7.00
Ground, f.o.b. Va.	net ton	10.00	20.00
Imp., powd.	net ton	45.00	50.00
Feldspar, No. 1 f.o.b. N.C.	long ton	6.50	7.25
No. 2 f.o.b. N.C.	long ton	4.50	5.00
No. 1 gr'd. Me.	long ton	19.00	20.00
No. 1 Can., f.o.b., mill, powd.	long ton	25.00	....
Graphite, Ceylon, lump, first quality, bbl.	lb.	.05½	.06
High grade amorphous crude	ton	15.00	35.00
Gum arabic, amber, sorts, bags	lb.	.12	.12½
Tragacanth, sorts, bags	lb.	.50	.55
No. 1, bags	lb.	1.15	1.20
Kieselguhr, f.o.b. Cal.	ton	40.00	42.00
F.o.b. N.Y.	ton	50.00	55.00
Magnesite, calcined	ton	35.00	42.50
Pumice stone, imp., casks	lb.	.03	.40
Dom., lump, bbl.	lb.	.06	.08
Dom., ground, bbl.	lb.	.03	.05
Silica, glass sand, f.o.b. Ind.	ton	2.00	2.25
Sand blast, f.o.b. Ind.	ton	2.25	3.50
Amorphous, 200-mesh, f.o.b. Ill.	ton	20.00	....
Glass sand, f.o.b. Ill.	ton	2.00	2.25
Soapstone, coarse, f.o.b., Vt., bags	ton	7.00	7.50
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	10.50	....
200 mesh, f.o.b., Ga.	ton	8.50	10.00
325 mesh, f.o.b. New York, grade A	ton	14.75	....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$3.00	$3.10
Corning	bbl.	1.75	....
Cabell	bbl.	1.70	....
Somerset	bbl.	1.80	....
Illinois	bbl.	1.37	....
Indiana	bbl.	1.38	....
Kansas and Okla. under 28 deg.	bbl.	.75	.85
California, 35 deg. and up	bbl.	1.40	....

Gasoline, Etc.

Motor gasoline steel bbls.	gal.	$0.15	....
Naphtha, V. M. & P. deod, steel bbls.	gal.	.14½	....
Kerosene, ref. tank wagon	gal.	.13	....
Bulk, W.W. delivered, N.Y.	gal.	.08½	....
Lubricating oils:			
Cylinder, Penn., filtered	gal.	.34	$0.35
Bloomless, 30@ 31 grav.	gal.	.24	....
Paraffin, pale 885 vis.	gal.	.16½	.17
Spindle, 200, pale	gal.	.25	.26
Petrolatum, amber, bbls.	lb.	.04	.04½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140	$145
Chrome brick, f.o.b. Eastern shipping points	ton	45	47
Chrome cement, 40-50% Cr_2O_3	ton	23	27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00	
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	40	43
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	33	37
Magnesite brick, 9-in. straight (f.o.b. wks)	ton	65	68
9-in. arches, wedges and keys	ton	80	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48	50
9-in. sizes, f.o.b., Birmingham	1,000	48	50
F.o.b. Mt. Union, Pa.	1,000	33	35
Silicon carbide refract brick, 9-in.	1,000	1,180	00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls	ton	$200.00	....
Ferrochromium, per lb. of Cr, 1-2% C.	lb.	.30	....
4-6% C.	lb.	.10½	.11
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	110.00	....
Spiegeleisen, 19-21% Mn.	gr. ton	32.00	33.00
Ferromolybdenum, 50-60% Mo, per lb. Mo.	lb.	1.80	2.00
Ferrosilicon, 10-12%	gr. ton	39.50	43.50
50%	gr. ton	72.00	75.00
Ferrotungsten, 70-80% per lb. of W.	lb.	.85	.90
Ferro-uranium, 35-50%, of U, per lb. of U.	lb.	4.50	....
Ferrovanadium, 30-40%, per lb. of V.	lb.	3.25	4.00

Ores and Mineral Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$5.50	$8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00	....
C.i.f. Atlantic seaboard	ton	18.50	24.00
Coke, fdry., f.o.b. ovens	ton	4.50	5.00
Coke, furnace, f.o.b. ovens	ton	4.25	4.50
Fluorspar, gravel, f.o.b. mines, Illinois	ton	17.50	18.50
Ilmenite, 52% TiO_2 Va.	lb.	.01½	....
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.39	.41
Manganese ore, chemical (MnO_2)	ton	75.00	80.00
Molybdenite 85% MoS_2, per lb. Mo S_2, N. Y.	lb.	.65	.75
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06	.08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.12	....
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12	....
Rutile, 94@96% TiO_2	lb.	.12	.15
Tungsten ore, scheelite, 60% WO_3 and over	unit	9.00	9.25
Tungsten, wolframite, white, 60% WO_3	unit	8.85	9.00
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	12.25	12.50
Vanadium pentoxide, 76%	lb.	3.00	3.25
Vanadium ore, per lb. V_2O_5	lb.	1.00	1.25
Zircon, 99%	lb.	.06	.07

Non-Ferrous Metals

Copper, electrolytic	lb.	$0.15	$0.15½
Aluminum, 98 to 99%	lb.	.27	.28
Antimony, wholesale, Chinese and Japanese	lb.	.17½	.17½
Nickel, 99%	lb.	.29	.33
Monel metal	lb.	.32	
Tin, 5-ton lots, Straits	lb.	.58½	
Lead, New York, spot	lb.	.0960	
Zinc, spot, New York	lb.	.0815	
Silver (commercial)	oz.	.66¾	
Cadmium	lb.	.60	.62
Bismuth (500 lb. lots.)	lb	1.25	1.30
Cobalt	lb.	2.50	3.00
Magnesium, ingots, 99%	lb.	.90	.95
Platinum, refined	oz.	117.00	
Mercury	75 lb.	75.00	75.50
Tungsten powder	lb.	.95	1.00

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Hawaiian Sugar Planters' Assn., P. O. Box 411, Honolulu, Hawaii.

Illuminating Engineering Society. Gen. Sec., Norman D. MacDonald, 29 W. 39th St., New York.

Insecticide & Disinfectant Mfrs. Assn., Inc. Sec., H. W. Cole, Holbrook, Mass.

Institute of Amer. Meat Packers. Pres., C. E. Herrick, 509 S. Wabash Ave., Chicago, Ill.

Institute of Makers of Explosives. Sec., C. Stewart Comeaux, 103 Park Ave., New York.

Institute of Margarin Manufacturers. Sec., Dr. J. S. Abbott, 1049 Munsey Bldg., Washington, D. C.

Institute of Metals. Sec., G. Shaw Scott, 36 Victoria St., Westminster, London, S. W. 1, England.

Institute of Radio Engineers. Sec., Dr. Alfred N. Goldsmith, 37 West 39th St., New York.

Institution of Engineers & Shipbuilders in Scotland. Sec., Edward H. Parker, Elmbank Crescent, Glasgow, Scotland.

Institution of Mining & Metallurgy. Sec., Charles McDermid, Cleveland House, 225 City Road, London, E. C. 1, England.

Institution of Petroleum Technologists. Sec., Commander R. E. Stokes-Rees, Aldine House, Bedford St., Strand, London, W. 2, England.

Instituto Cientifico e Industrial del Salitre. Gen. Sec., Belisario Diaz Ossa. Casilla 2730, Santiago, Chile.

International Acetylene Assn. Sec.-Treas., A. Cressy Morrison, 30 E. 42nd St., New York.

Interstate Cotton Seed Crushers' Assn., Inc. Sec., Geo. H. Bennett, 201 N. Texas Bldg., Dallas, Tex.

Inventors' League of the U. S., 114 Maiden Lane, New York.

Iron & Steel Institute. Sec., G. C. Lloyd, 28 Victoria St., London, S. W. 1, England.

Junior Institution of Engineers. 39 Victoria St., Westminster, S. W. 1, England.

Manufacturing Chemists Assoc. of the U. S. Sec., J. I. Tierney, 540 Woodward Bldg., Washington, D. C.

Metric Assn. Sec., Howard Richards, 156 5th Ave., New York.

Mining & Metallurgical Soc. of Amer. Sec., Donald M. Liddell, 2 Rector St., New York.

Mirror Mfrs. Assn. Sec., H. C. Sorden, Shelbyville, Ind.

National Academy of Sciences. Sec., David White, National Academy of Sciences, 21 and B Sts., Washington, D. C.

National Assn. of Composition Flooring Mfgrs. Sec.-Treas., Robert W. Page, 1328 Broadway, New York.

National Assn. of Cost Accountants. Sec., Stuart C. McLeod, 130 W. 42nd St., New York.

National Assn. of Cotton Mfrs. Sec., Harry C. Meserve, 80 Federal St., Boston, Mass.

National Assn. of Glue Mfrs. Inc., Sec., H. B. Sweatt, 1457 Broadway, New York.

National Association of Importers of Hides & Skins, Inc. Exec. Sec., John R. Arnold, 15 Park Row, New York.

National Assn. of Leather Belting Mfrs. Sec., George H. Blake, P. O. Box 859, City Hall Sta., New York.

National Assn. of Mfrs. of Pressed & Blown Glassware. Sec., John Kunzler, House Bldg., Pittsburgh, Pa.

National Assn. of Mfrs. Sec., George S. Boudinot, 59 Church St., New York.

National Assn. of Oxy-Chloride Cement Mfgrs. Sec.-Treas., Robert W. Page, 461 8th Ave., New York.

National Assn. of Practical Refrigerating Engrs. Sec., E. H. Fox, 5707 West Lake St., Chicago, Ill.

National Assn. of Purchasing Agents. Sec., W. L. Chandler, Woolworth Bldg., New York.

National Assn. of Sheet & Tin Plate Mfrs. Sec.-Treas., Walter W. Lower, 421 Oliver Bldg., Pittsburgh, Pa.

National Bottle Mfrs. Assn. Sec., W. B. Swindell, c/o Swindell Bros., Baltimore, Md.

National Brick Manufacturers' Assn. Sec., Theodore A. Randall, 211 Hudson St., Indianapolis, Ind.

National Canners' Assn. Sec., Frank E. Gorrell, 1739 H Street, N.W., Washington, D. C.

National Coal Assn. Exec. Sec., H. L. Gandy, 801 Southern Bldg., Washington, D. C.

National Conference of Business Paper Editors. Sec., Alfred G. Oehler, c/o *Railway Electrical Engineer*, 30 Church St., New York.

National Elec. Light Assn. Exec. Mgr., M. H. Aylesworth, 29 W. 39th St., New York.

National Fertilizer Assn. Sec., John D. Toll, c/o *American Fertilizer*, 1010 Arch St., Philadelphia, Pa.

National Fire Protection Assn. Sec., Franklin H. Wentworth, 40 Central St., Boston, Mass.

National Foreign Trade Council. Sec., O. K. Davis, 1 Hanover Sq., New York.

National Gas Products Assn. Asst. Sec., A. T. Kitchel, 41 E. 42nd St., New York.

National Industrial Conference Board. Comptroller, James M. Robertson, 247 Park Ave., New York.

National Industrial Council. Sec. and Treas., Earl Constantine, 50 Church St., New York.

National Institute of Inventors. Sec., R. Nerenstone, 8 E. 14th St., New York.

National Lime Assn. Gen. Mgr., Burton A. Ford, 918 G St., N.W., Washington, D. C.

National Lumber Manufacturers Assn. of Chicago. Sec., Wilson Compton, Transportation Bldg., Washington, D. C.

National Metal Trades Assn. L. W. Fischer, 1019 Peoples Gas Bldg., Chicago, Ill.

National Paint, Oil & Varnish Assn. Sec., G. V. Horgan, 18 East 41st St., New York.

National Paving Brick Mfrs. Assn. Sec., Edward E. Duff, Jr., Engineers Bldg., Cleveland, Ohio.

National Petroleum Assn. C. D. Chamberlin, 823 Guardian Bldg., Cleveland, Ohio.

National Petroleum Marketers Assn. Pres., L. V. Nicholas, 76 W. Monroe St., Chicago, Ill.

National Pipe & Supplies Assn. Sec., Geo. D. McIlvaine, 908 Oliver Bldg., Pittsburgh, Pa.

National Research Council. Sec., Dr. Vernon Kellogg, B and 21st Sts., Washington, D. C.

National Safety Council. Sec., W. H. Cameron, 168 N. Michigan Ave., Chicago, Ill.

National Varnish Mfrs. Assn. Sec., G. B. Heckel, 509 The Bourse, Philadelphia, Pa.

National Wood Chemical Assn. Sec.-Treas., F. J. Goodfellow, 76 Main St., Bradford, Pa.

Natural Gas Assn. of America. Sec., William B. Way, 904 Oliver Bldg., Pittsburgh, Pa.

New Jersey Chemical Society. Sec., Frederick W. Zons, 367 High St., Newark, N. J.

New Jersey Clay Workers Assn. & Eastern Section of the American Ceramic Society. Sec., G. H. Brown. Ceramics Dept., Rutgers College, New Brunswick, N. J.

New York Academy of Sciences. Sec. Dr. Ralph W. Tower, 77th St. and Central Park West, New York City.

Oil & Colour Chemists' Assn. Sec., H. A. Carwood, 53 Groombridge Rd., London E. 9, England.

Paint Mfrs.' Assn. of the U. S. Sec., G. B. Heckel, 509 The Bourse, Philadelphia, Pa.

Plate Glass Mfrs. of Amer. Sec., P. A. Hughes. First National Bank Bldg., Pittsburgh, Pa.

Portland Cement Assn. Sec.-Gen. Mgr., William M. Kinney, 111 W. Washington St., Chicago, Ill.

Refractories Manufacturers Assn. Sec., Frederic W. Donahoe, 840 Oliver Bldg., Pittsburgh, Pa.

Rubber Assn. of America. A. L. Viles, Gen. Mgr. and Sec., 250 West 57th St., New York.

Rubber Growers' Assn., Inc. Frank S. Smith, Sec., 2, 3 and 4 Idol Lane, Eastcheap, London, E.C. 3, England.

Salesmen's Assn. of the American Chemical Industry. Sec., A. J. Binder, c/o Sherwin-Williams Co., 115 Broadway, New York.

Salt Producers Assn. Sec., D. B. Doremus, 550 Penobscot Bldg., Detroit, Mich.

Sand-Lime Brick Assn. Pres., J. Morley Zander, Saginaw, Mich.

Société de Chimie Industrielle. Sec., Jean Gerard, 49 Rue des Mathurins, Paris, France.

Société d'encouragement pour l'industrie Nationale. 44 rue de Rennes, Paris, France.

Society of Chemical Industry. Sec., J. P. Longstaff, 46 Finsbury Sq., London, E.C. 2, England.

Society of Chemical Industry (N. Y. Section). Sec., Allen Rogers, Pratt Institute, Brooklyn, N. Y.

Society of Dyers & Colourists. Sec., J. B. Atkinson, Pearl Assurance Bldgs., Market St., Bradford, England.

Society of Glass Technology. Sec., S. English, Darnall Road, Sheffield, England.

Society of Industrial Engrs. Exec. Sec., George C. Dent, 608 S. Dearborn St., Chicago, Ill.

Society of Leather Trades Chemists. Sec., W. R. Atkin, University, Leeds, England.

Society for the Promotion of Engineering Education. Sec., Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

South African Chemical Institute. Sec., James Gray, Box 5254, Johannesburg, So. Africa.

South African Institution of Engrs., Inc. Sec., W. W. R. Jago, Box 4609, Johannesburg, So. Africa.

Steel Barrel Mfrs. Assn. Sec., D. S. Hunter, 428 Bulkley Bldg., Cleveland, Ohio.

Structural Steel Society. Sec.-Treas. Chas. O. Baughman, Morava Construction Co., 8457 Stewart Ave., Chicago, Ill.

Synthetic Organic Chem. Mfrs. Assn. of the U. S. Exec. Officer, Dr. Chas. H. Herty, Pres., Room 343, 1 Madison Ave., New York.

Talc & Soapstone Producers Assn. Sec.-Treas., Raymond B. Ladoo, Room 1105, 342 Madison Ave., New York City.

Tanners' Council. Sec., E. A. Brand, 41 Park Row, New York.

Taylor Society. Managing Director, Harlow S. Person, 29 W. 39th St., New York.

Technical Assn. of the Pulp & Paper Industry. Sec., W. G. MacNaughton, 18 E. 41st St., New York.

Technical Photographic & Microscopical Soc. Sec.-Treas., Alfred B. Hitchins, c/o Ansco Co., Binghamton, N. Y.

Technical Publicity Assn. Sec., C. L. Packard, Western Electric Co., Room 1414, 100 E. 42nd St., New York.

Textile Alliance. Pres., A. M. Patterson, 45 E. 17th St., New York.

Turpentine and Rosin Producers Assn. Sec., C. F. Speh, Whitney-Central Bldg., New Orleans, La.

Union Internationale de la Chimie Pure et Applique. Sec., Jean Girard, 49 Rue des Mathurins, Paris, France.

United Engineering Society. Sec., Alfred D. Flinn, 29 W. 39th St., New York.

U. S. Potash Producers' Assn. Exec. Sec., Frederick W. Brown, 604 Southern Bldg., Washington, D. C.

U. S. Potters Assn. Sec., Charles F. Goodwin, East Liverpool, Ohio.

U. S. Pulp Producers Assn. Sec., Oliver M. Porter, 18 E. 41st St., New York.

U. S. Sugar Manufacturers Assn. Sec., Harry A. Austin, 901 Union Trust Bldg., Washington, D. C.

Washington Academy of Science. Sec., F. B. Silsbee, Bureau of Standards, Washington, D. C.

Western Petroleum Refiners Assn. Sec., John Reynolds, 304 Inter-State Bldg., Kansas City, Mo.

Industrial Developments of the Week

New Construction and Machinery Requirements in the Process Industries

Some Opportunities This Week

Brass .....Cleveland, O.
Brass .....Vermilion, O.
Clay Products .....Bessemer, Ala.
Clay Products .....Parkersburg, W. Va.
Glass .....Cleveland, O.
Leather .....Miami, Fla.
Linoleum .....Trenton, N. J.
Oil and Gasoline .....Mexia, Tex.
Oil Refining .....Enid, Okla.
Paper .....St. Joseph, d'Alma, Que.
Steam Laboratory .....Pasadena, Calif.
Solidite Products .....Lake Wales, Fla.
Sugar .....Memphis, Tenn.
Sugar .....Bellingham, Wash.
Terra Cotta .....Philadelphia, Pa.

New England

Mass., Everett—Beacon Oil Co., 111 Devonshire St., Boston, plan the construction of a 2 and 3 story addition to the plant on Beacham St., here. Estimated cost $50,000. Engineer not selected.

Middle Atlantic

N. J., Trenton—W. & J. Sloane Mfg. Co., 5th Ave., and 47th St., New York, N. Y. has commissioned Lockwood, Green & Co., Engrs., 1 Pershing Sq., New York, N. Y., to act as engineers and construction managers for the construction of a complete plant at Hamilton Township, for the manufacture of linoleum.

Pa., Philadelphia—Conkling Armstrong Terra Cotta Co., Denckla Bldg., will build a 3 story 50 x 128 ft., plant on Wissahickon and Hunting Park Aves., by day labor. Estimated cost. $40,000. Private plans.

South

Ala., Bessemer—The Harbison-Walker Refractory Co., Farmers Blk., Pittsburgh, Pa., will soon award contract for the construction of a clay products plant on 32nd St., extending from 5th to Arlington Aves. Estimated cost $500,000. Contract for the excavation of the plant was awarded to The Bessemer Eng. and Constr. Co., Bessemer.

Fla., Lake Wales—Solidite Products Co., Inc., U. H. Clark, Pres., St. Petersburg, plans to construct plant, for the manufacture of product similar to cement. Estimated cost $150,000.

Fla., Miami—Lloyd Sea Leather Tanning Co., 107 Bedford Bldg., organized by W. J. Lloyd, 702 North East First Ave., has acquired a building for the tanning and manufacture of shark skins into souvenirs, etc.

Tenn., Memphis—University of Tennessee plans the construction of a group of buildings on Union Ave., including a chemistry building. Jones & Furbringer, Porter Bldg., Memphis, Tenn., are architects.

Tenn., Memphis—International Sugar Feed Co., Bank of Commerce Bldg., plans to rebuild the interior of large mill on Mallory St., New South Memphis, new equipment, machinery, etc., will be installed. W. A. Hall is purchasing agent.

W. Va., Parkersburg—Parkersburg Clay Products Co., capital $200,000, incorporated by G. L. Dudley, Sr., D. L. Dudley, Jr., and others; plans the construction of a plant for the manufacture of hollow tile, building brick, etc., on Staunton Pike.

Middle West

O., Canton—United Alloy Steel Corp. 1949 Harrison Ave., S. W. plans the construction of 2 factory buildings to replace fire loss. Machinery and equipment will be required for the galvanizing department. Estimated cost $100,000.

$110,000,000

Construction to that amount planned by the process industries has been reported on this page in the last three months alone.

In addition to this projected physicial expansion in *Chem. & Met.'s* field, there was announced here the incorporation of 125 companies that will operate in this field.

These figures support the opinion expressed editorially last week that those who supply equipment and materials to these industries should experience a profitable year in 1925.

O., Cleveland—General Glass Co., J. Copperstein, 6009 Carnegie Ave., is taking bids for the construction of a 1 and 2 story, 30x96 ft., factory on 10626 Cedar Ave. Estimated cost $75,000. L. Skolnik, Sixth St., Clair Bldg., is Cleveland architect.

O., Cleveland—Sterling Brass Co., S. Weil, Pres., 9600 St. Catherine Ave., is having plans prepared for the construction of a 2 story, 40x125 ft., factory and warehouse on St. Catherine Ave. Estimated cost $75,000. A Sogy, 3030 Euclid Ave., is architect.

O., Vermillion—The Wakefield Brass Co., Vermillion, awarded the contract for the construction of a 1 story, 60x160 ft., manufacturing plant to The Austin Co., 16112 Euclid Ave., Cleveland. Estimated cost $40,000.

West of Mississippi

Tex., Mexia—Humphreys-Boyd Oil Co. and Gasoline Recovery Co., Moore Bldg., Charleston, W. Va., plans the construction of a natural gasoline manufacturing plant, capacity 20,000,000 cu. ft. of gas daily. Estimated cost $150,000.

Okla., Enid—Oil State Refining Co., plans to rebuild 6 stills of refinery, destroyed by fire at loss of $50,000.

Far West

Calif., Pasadena—California Institute of Technology, 1201 East California St., awarded the contract for the construction of a 2 story, 50x140 ft., steam laboratory on East California St., $90,000.

Wash., Bellingham—Utah—Idaho Sugar Co., Salt Lake City, Utah, B. R. Smott, Gen. Supt. will soon take bids for the construction of a beet sugar factory here. Estimated cost. $1,500,000.

Canada

Que., St. Joseph d'Almo—Price Bros. & Co., has awarded the contract for the new Lake St. John paper mill to W. I. Bishop, Ltd., Montreal.

Unverified

S. A., Brazil—Preparations are being made for the construction of a large cement factory in the city of Rio Grande. The company building the plant will be capitalized at 10,000 contos (about $1,150,000) of which half is to be obtained by public subscriptions and the remainder will be in the form of loans from the government.

Incorporations

Altoona Glass Products Corporation, manufacturing glass, $1,300,000. (Incorporated Dover, Del.)

L. & G. Lengyel, Brooklyn, N. Y., perfumes, $15,000; L. and G. Lengyel. A. G. Bechtold. (Attorney, H. E. Histad, 190 Montague St., Brooklyn.)

E. L. Gayvert & Co., Gowanda, Cattaraugus County, N. Y., petroleum products, $25,000; E. L. Gayvert, S. A. Neilson, H. A. Howard. (Attorney, W. J. Wilber, Gowanda.)

H. Baron & Co., New York, extracts, $250,000; H. and L. Baron. I. S. Brightman. (Attorney, Albany Service, 299 Broadway, New York.)

Mendlik Co., Inc., Lowell, Mass, magnesite products; $50,000; incorporators, V. F. Mendlik and H. W. Longden of Lowell and T. V. Healey of Dracut.

Seplosal Co., Rochester, N. Y., chemical compounds, $150,000; C. F. and C. B. Neafie, J. L. Husk, (Attorney, C. B. Gordon, Rochester).

Manhattan Enamel Ware Co., New York, $150,000; D. Nadelson, F. Freeman, J. Morrison, (Attorneys, Marks & Marks, 358 5th Ave.)

Arthur S. Zabriskie, Manhattan, paper manufacturing, $100,000; S. C. Zabriskie, J. P. J. Morris. (Attorney, J. R. McMullen, 1 Bway.)

Franco-Azetca Petroleum Co., New York, $20,000,000. (United States Corporation Co.)

United States Sanitary Hand Cleanser, Inc., soap, etc., $25,000. M. Spiegler, 625 Park Ave., and L. Goldstein, 830 Myrtle Ave., Brooklyn, and S. Goldstein, 77 Essex St., Manhattan.

Cubinola Chemical Co., Philadelphia, Pa., manufacture, $50,000. (Corp. Guarantee & Trust Co.)

Smith Rubber Heel Co., 721 Appleton St., Baltimore, $25,000, A. G. Schmidt, J. O. Selby and W. L. Schmidt.

Kuhn Paint & Varnish Works, Houston, Tex., $200,000, H. A. Wree, A. Frank, 2520 Leona St., etc.

New Dominion Amlestite Co., Wilmington, Del., manufacture, $1,200,000. (Delaware Registration Trust Co.)

Beauty Products Co., Wilmington, Del., manufacture toilet articles, $500,000; R. T. Cameron, J. A. Padget, Memphis, Tenn.; A. A. Hoover, Wilmington. (Corporation Trust Co. of America.)

Chastir Fibre Products Co., manufacture, Wilmington, $100,000; H. McKeown, T. F. Galantee, E. F. Furt. (J. B. Jester, Wilmington.)

Refiners Supplies Co., Wilmington, petroleum, $50,000. (Corporation Trust Co. of America.)

Tulsa Gas Producing Co., Kansas City, Kan., $750,000 to $1,000,000. Savarese Manufacturing Corp., New York, food products, $1,500,000. (U. S. Corp. Co.)

Crusader Oil Corp., Wilmington, Del., refine, $500,000. (Corp. Trust Co., of America.)

Sunny Jim Products Co., Wilmington, manufacture foodstuffs, $200,000. (Corp. Trust Co., of America.)